QGIS User Guide

Rilis 2.0

QGIS Project

16 May 2014

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BAB 1

Pendahuluan

Dokumen ini merupakan buku petunjuk asli dari perangkat lunak yang dijelaskan QGIS. Perangkat lunak dan perangkat keras yang dijelaskan dalam dokumen ini dalam banyak kasus merupakan merek dagang terdaftar dan karena itu tunduk pada persyaratan hukum. QGIS menggunakan Lisensi Publik Umum GNU (GNU General Public License). Temukan informasi lebih lanjut pada QGIS alamat web http://www.qgis.org.

Detil, data, hasil dll. pada dokumen ini telah ditulis ulang dan diverifikasi dengan sebaik mungkin pengetahuan dan tanggungjawab dari penulis dan editor. Bagaimanapun juga, dimungkinkan adanya kesalahan pada isi dokumen ini.

Oleh karena itu, semua data tidak bertanggung jawab untuk setiap pekerjaan atau jaminan. Para penulis, editor dan penerbit tidak mengambil tanggung jawab atau kewajiban atas kegagalan dan konsekuensinya. Selalu terbuka bagi Anda untuk menunjukkan kemungkinan kesalahan.

Dokumen ini telah diatur dengan reStructuredText. Ini tersedia sebagai sumber kode reST di github dan dalam jaringan (online) dengan format HTML dan PDF di http://www.qgis.org/en/docs/. Versi terjemahan dari dokumen ini dapat diunduh dalam beberapa format melalui proyek dokumentasi QGIS. Informasi lebih lanjut tentang kontribusi pada dokumen ini dan tentang menerjemahkannya, silakan kunjungi: http://www.qgis.org/wiki/.

Tautan pada dokumen ini

Dokumen ini berisi tautan internal dan eksternal. Silakan klik pada tautan internal akan membuka dokumen, sedangkan klik tautan eksternal membuka alamat internet. Dalam bentuk PDF, tautan internal dan eksternal diperlihatkan dengan warna biru dan ditangani oleh sistem peramban web (browser). Dalam bentuk HTML, menampilkan peramban web (browser) dan menangani keduanya secara identik.

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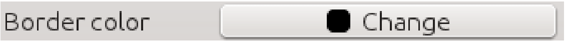
BAB 2

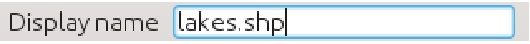
Konvensi

Bagian ini menjelaskan koleksi gaya seragam di seluruh panduan. Konvensi yang digunakan dalam panduan ini adalah sebagai berikut:

2.1 Konvensi GUI

Gaya konvensi GUI dimaksudkan untuk meniru tampilan GUI. Secara umum, tujuannya adalah untuk menggunakan penampilan non-hover, sehingga pengguna dapat memindai visual GUI untuk menemukan sesuatu yang tampak seperti perintah di panduan.

- Menu Pilihan: *Lapisan* → *Tambah Lapisan Raster* atau :menuselection:‘Pengaturan –> Toolbar –> Digitalisasi
- Alat: Tambah Lapisan Raster
- Tombol : **[Simpan sebagai Default]**
- Kotak Judul: *Properti Lapisan*
- Tab: *Umum*
- Kotak Centang: ☑ *Render*
- Tombol Radio: ● *Postgis SRID* ○ *EPSG ID*
- Pilih Nomor: 1,00
- Pilih String: ... ▼
- Lihat Berkas: ...
- Pilih Warna: 

Border color ● Change
- Slider:
- Masukkan Teks: 

Display name lakes.shp

Sebuah bayangan menunjukkan komponen GUI yang dapat diklik.

2.2 Konvensi Teks atau Papan Ketik

Panduan ini juga mencakup gaya yang berhubungan dengan teks, perintah papan ketik dan pemrograman (coding) untuk menunjukkan entitas yang berbeda, seperti kelas, atau metode. Mereka tidak sesuai dengan setiap penampilan yang sebenarnya.

- Pranala: http://qgis.org

- Kombinasi Keystroke: tekan `Ctrl+B`, artinya tekan dan tahan tombol Ctrl dan tekan tombol B.
- Nama Berkas: `lakes.shp`
- Nama Kelas: **LapisanBaru**
- Metode: *classFactory*
- Server: *myhost.de*
- Teks Pengguna: `qgis --help`

Baris kode ditunjukkan dengan huruf fixed-width

```
PROJCS["NAD_1927_Albers",
  GEOGCS["GCS_North_American_1927",
```

2.3 Petunjuk Spesifik Platform

Urutan GUI dan sejumlah kecil teks dapat diformat inline: Klik 🐧 🪟 *Berkas* X *QGIS → Keluar untuk tutup QGIS*.

Hal ini menunjukkan bahwa di Linux, Unix dan platform Windows, klik pilihan menu pertama Berkas, kemudian Keluar dari menu dropdown, sementara di Macintosh OSX platform, klik QGIS menu pilihan pertama, kemudian Keluar dari menu dropdown.

- 🐧 melakukan ini;
- 🪟 melakukan itu;
- X melakukan sesuatu yang lain.

atau sebagai paragraf.

🐧 X Lakukan ini dan ini dan ini. Kemudian melakukan ini dan ini dan ini dan ini dan ini dan ini dan ini dan ini dan ini.

🪟 Lakukan itu. Kemudian melakukan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu dan itu.

Layar yang muncul di seluruh buku panduan telah dibuat pada platform yang berbeda; platform ditunjukkan dengan ikon-platform tertentu pada akhir gambar keterangan.

Kata Pengantar

Selamat datang di dunia indah dari Sistem Informasi Geografis (GIS)!

QGIS adalah Sistem Informasi Geografis Sumber Terbuka (Open Source). Proyek ini lahir di bulan Mei 2002 dan didirikan sebagai sebuah proyek di SourceForge pada bulan Juni tahun yang sama. Kami telah bekerja keras membuat perangkat lunak GIS (merupakan perangkat lunak proprietary tradisional mahal) prospek yang layak bagi siapa saja dengan akses dasar ke Personal Komputer. QGIS saat ini berjalan pada kebanyakan platform Unix, Windows, dan OS X. QGIS dikembangkan menggunakan toolkit Qt (http://qt.digia.com) dan C++. Ini berarti bahwa QGIS terasa cepat dan menyenangkan, antarmuka pengguna grafis yang mudah digunakan (GUI).

QGIS bertujuan untuk menjadi GIS yang mudah digunakan, menyediakan fungsi dan fitur-fitur umum. Tujuan awalnya adalah untuk menyediakan penampil data GIS. QGIS telah mencapai titik dalam evolusi di mana ia digunakan sehari-hari oleh banyak orang untuk kebutuhan melihat data GIS mereka. QGIS mendukung sejumlah format data raster dan vektor, dengan dukungan format baru mudah ditambahkan dengan menggunakan arsitektur plugin.

QGIS is released under the GNU General Public License (GPL). Developing QGIS under this license means that you can inspect and modify the source code, and guarantees that you, our happy user, will always have access to a GIS program that is free of cost and can be freely modified. You should have received a full copy of the license with your copy of QGIS, and you also can find it in Appendix *GNU General Public License*.

Tip: Pembaruan Dokumentasi

Versi terbaru dari dokumen ini selalu dapat ditemukan di website dokumentasi QGIS di http://www.qgis.org/en/docs/

Keistimewaan

QGIS menawarkan banyak fungsi GIS umum yang disediakan oleh fitur inti dan plugin. Sebagai ringkasan singkat, disajikan dalam enam kategori untuk mendapatkan wawasan pertama.

4.1 Lihat data

Anda dapat melihat dan overlay data vektor dan raster dalam format dan proyeksi yang berbeda tanpa konversi ke format internal maupun umum. Format yang didukung termasuk:

- Spasial-enabled tabel dan tampilan menggunakan PostGIS, SpatiaLite dan MSSQL Spasial, Oracle Spasial, format vektor yang didukung oleh library OGR, termasuk ESRI shapefile, MapInfo, SDTS, GML dan banyak lagi, lihat bagian *Pekerjaan dengan Data Vektor*.
- Format raster dan citra yang didukung dengan terpasangnya GDAL (Geospatial Data Abstraction Library) perpustakaan, seperti GeoTiff, Erdas Img., ArcInfo Ascii Grid, JPEG, PNG dan banyak lagi, lihat bagian *Pekerjaan dengan Data Raster*.
- QGIS kerangka pengolahan untuk memanggil ratusan algoritma pihak asli dan ketiga dari QGIS, lihat bagian Processing *Pengantar*.
- Data raster dan vektor GRASS dari basis data GRASS (lokasi/mapset), lihat bagian *GRASS GIS Integration*.
- Online data spasial sebagai Layanan OGC Web, seperti (WMS, WMTS, WCS, WFS, WFS-T, ...), lihat bagian *Pekerjaan dengan Data OGC*.
- Data OpenStreetMap, lihat bagian *plugins_osm*.

4.2 Jelajahi data dan menyusun peta

Anda dapat membuat peta interaktif dan mengeksplorasi data spasial dengan GUI yang ramah. Banyak alat yang tersedia di GUI termasuk misalnya:

- QGIS peramban web
- On-the-fly proyeksi ulang
- Pengelola DB
- Penyusun Peta
- Panel Peninjau
- Bookmark spasial
- Annotation tools
- Identifikasi/pilih fitur
- Sunting/lihat/cari atribut

- Pelabelan Fitur juga data yang didefinisikan
- Perubahan simbologi vektor dan raster juga data yang didefinisikan
- Penambahan lapisan graticule untuk membuat komposisi peta atlas
- Hiasi peta Anda dengan panah arah utara, bar skala dan label hak cipta
- Menyimpan dan mengembalikan proyek

4.3 Membuat, menyunting, mengelola dan ekspor data

Anda dapat membuat, mengedit, mengelola dan ekspor lapisan vektor dan raster dalam beberapa format. QGIS menawarkan misalnya sebagai berikut:

- Alat Digitalisasi yang didukung format OGR dan lapisan vektor GRASS
- Membuat dan menyunting shapefile dan lapisan vektor GRASS
- Geocode gambar dengan Plugin Georeferencer
- Alat GPS untuk mengimpor dan mengekspor format GPX, dan mengkonversi format GPS lain ke GPX atau unduh/unggah langsung ke unit GPS (di Linux, usb: telah ditambahkan ke daftar perangkat GPS)
- Memvisualisasikan dan mengedit data OpenStreetMap
- Membuat tabel basis data spasial dari shapefile dengan Plugin Pengelola DB
- Peningkatan penanganan tabel basis data spasial
- Mengelola tabel atribut vektor
- Simpan cuplikan layar sebagai gambar bergeoreferensi

4.4 Analisis data

Anda dapat melakukan analisis data spasial pada basis data spasial dan format OGR lain yang didukung. QGIS saat ini menawarkan analisis vektor, sampling, geoprocessing, geometri dan aplikasi manajemen basis data. Anda juga dapat menggunakan aplikasi GRASS terintegrasi, yang meliputi fungsi GRASS lengkap lebih dari 400 modul (lihat bagian *GRASS GIS Integration*). Atau Anda bekerja dengan Plugin Processing, yang menyediakan kerangka analisis geospasial yang kuat untuk memanggil algoritma pihak asli dan ketiga dari QGIS, seperti GDAL, SAGA, GRASS, fTools dan banyak lagi (lihat bagian *Pengantar*).

4.5 Terbitkan peta di Internet

QGIS dapat digunakan sebagai WMS, WMTS, WMS-C atau WFS dan WFS-T client, dan sebagai WMS atau WFS server (lihat bagian *Pekerjaan dengan Data OGC*). Selain itu Anda dapat mengekspor data, mempublikasikan mereka di internet menggunakan webserver dengan UMN MapServer atau GeoServer yang terpasang.

4.6 Memperpanjang fungsionalitas QGIS melalui plugin

QGIS dapat disesuaikan dengan kebutuhan khusus Anda dengan arsitektur plugin yang dapat diperpanjang. QGIS menyediakan perpustakaan (libraries) yang dapat digunakan untuk membuat plugin. Anda dapat membuat aplikasi baru dengan C++ atau Python!

4.6.1 Inti Plugin

1. Rekaman Koordinat (Tetikus merekam koordinat di CRS yang berbeda)
2. DB Manager (Pertukaran, mengedit dan melihat lapisan dan tabel; mengeksekusi query SQL)
3. Diagram Overlay (Menempatkan diagram pada lapisan vektor)
4. Dxf2Shp Converter (Mengubah DXF ke Shape)
5. eVIS (Event Visualization Tool)
6. fTools (Alat untuk analisis dan mengelola data vektor)
7. GDALTools (Integrasi alat GDAL ke dalam QGIS)
8. Georeferencer GDAL (Menambahkan informasi proyeksi ke raster menggunakan GDAL)
9. Alat GPS (Memuat dan impor data GPS)
10. GRASS (GRASS GIS integrasi)
11. Heatmap (Membangkitkan raster heatmap dari data titik)
12. Llugin Interpolation (interpolasi berdasarkan simpul dari lapisan vektor)
13. Ekspor Mapserver (Ekspor berkas proyek QGIS ke berkas peta MapServer)
14. Penyuntingan Luar Jaringan (Izinkan menyunting luar jaringan dan sinkronisasi dengan basis data)
15. Plugin Open Layer (lapisan OpenStreetMap, Google Maps, Bing Maps dan banyak lagi)
16. Oracle Spatial GeoRaster
17. Processing (formerly SEXTANTE)
18. Analisis terrain raster (analisis terrain berbasis raster)
19. Plugin road graph (Analisis jaringan terpendek)
20. Spatial Query Plugin
21. SPIT (Impor Shapefile ke PostgreSQL/PostGIS)
22. Plugin SQL Anywhere (Menyimpan lapisan vektor dengan basis data SQL Anywhere)
23. Topologi Checker (Menemukan kesalahan topologi dalam lapisan vektor)
24. Plugin Zonal statistics (hitung, jumlah, rata-rata raster untuk setiap poligon dari lapisan vektor)

4.6.2 Plugin Eksternal Python

QGIS menawarkan semakin banyak plugin python eksternal yang diberikan oleh masyarakat. Plugin ini berada di plugin repositori resmi, dan dapat dengan mudah dipasang menggunakan Python Plugin Installer (lihat bagian *Memuat Plugin eksternal QGIS*).

4.7 Python Console

Untuk scripting, memungkinkan untuk mengambil keuntungan dari konsol Python terintegrasi. Hal ini dapat dibuka dari menu: *Plugins* → *Python Console*. Konsol terbuka sebagai jendela utilitas non-modal. Untuk interaksi dengan lingkungan QGIS, ada variabel `qgis.utils.iface`, yang merupakan contoh dari `QgsInterface`. Interface ini memungkinkan akses ke kanvas peta, menu, toolbar dan bagian lain dari aplikasi QGIS.

Untuk informasi lebih lanjut tentang bekerja dengan plugin dan aplikasi Python Console dan Programming PyIqgI, silakan lihat http://www.qgis.org/html/en/docs/pyqgis_developer_cookbook/index.html.

BAB 5

Apa yang baru pada QGIS 2.0

Harap dicatat bahwa ini adalah rilis dalam ‘cutting edge’ seri rilis kami. Dengan demikian mengandung fitur baru dan memperluas program antarmuka dibanding QGIS 1.8.0. Kami menyarankan agar Anda menggunakan versi ini daripada rilis sebelumnya.

Rilis ini meliputi ratusan perbaikan kesalahan (bug) dan banyak fitur baru dan perangkat tambahan yang akan dijelaskan dalam panduan ini. Juga bandingkan dengan visual log perubahan (changelog) di http://changelog.linfiniti.com/qgis/version/200/

5.1 Antarmuka Pengguna

- **Tema ikon baru**: Kami telah memperbarui tema ikon kami untuk menggunakan tema ‘GIS’ memperkenalkan peningkatan konsistensi dan profesionalisme antar muka pengguna QGIS.
- **Tab samping, kotak kelompok lipat**: Kami memiliki standar tata letak tab dan memperkenalkan kotak kelompok dilipat ke dalam banyak dialog untuk membuat berbagai pilihan navigasi yang lebih mudah, dan untuk membuat lebih baik menggunakan layar real estat.
- **Notifikasi halus**: Dalam banyak kasus kami ingin memberitahu Anda tentang sesuatu, tetapi kami tidak ingin menghentikan pekerjaan anda. Dengan sistem notifikasi baru **|qg|** dapat memberitahu Anda tentang pentingnya informasi lewat bar pesan (warna tergantung pada pentingnya pesan) yang muncul di bagian atas kanvas peta tapi tidak mengganggu Anda untuk berurusan dengan itu jika Anda sedang sibuk melakukan pekerjaan yang lain. Programmer dapat membuat notifikasi tersebut (misalnya dari plugin) menggunakan API python kami.
- **Application custom font and Qt stylesheet**: Sistem huruf yang digunakan untuk aplikasi antarmuka pengguna sekarang dapat diatur. Plugin C++ atau Python yang merupakan anak dari aplikasi GUI QGIS atau telah disalin/menerapkan aplikasi GUI stylesheet dapat mewarisi gaya, yang berguna untuk perbaikan GUI di seluruh platform dan bila menggunakan kustom widget Qt QGIS, seperti QgsCollapsibleGroupBox.
- **Live color chooser dialogs and buttons**: Setiap warna tombol pemilih seluruh antarmuka telah diperbarui untuk memberikan umpan balik visual apakah memiliki transparan warna saat ini, atau ‘alpha,’ komponen. Warna pemilih dibuka oleh tombol warna baru, sekarang akan menjadi default untuk sistem operasi. Jika pengguna menggunakan live-update dialog pemilih warna diperiksa di bawah *Options -> General -> Application*, perubahan apapun dalam pemilih warna akan segera ditampilkan dalam warna tombol dan untuk setiap item saat ini sedang diedit, mana yang berlaku.
- **Anotasi SVG**: Dengan QGIS versi 2.0 kini, Anda dapat menambahkan anotasi (keterangan) SVG ke peta Anda - baik disematkan ke tempat tertentu atau dalam posisi relatif di atas kanvas peta.

5.2 Penyedia Data

- **Dukungan Stasial Oracle**: QGIS versi 2.0 kini termasuk Dukungan Stasial Oracle.

- **Penyedia Layanan Cakupan Web (Web Coverage Service)**: QGIS kini disediakan dukungan asli untuk lapisan Layanan Cakupan Web (Web Coverage Service) - proses untuk menambahkan WCS mirip dengan menambahkan lapisan (layer) WMS atau WFS.
- **Raster Data Provider overhaul**: Sistem penyedia data raster telah dirombak total. Salah satu fitur baru terbaik yang berasal dari pekerjaan ini adalah kemampuan *Layer -> Save As...* untuk menyimpan lapisan (layer) raster sebagai lapisan (layer) baru. Dalam proses ini, Anda dapat memotong, resample, reproject lapisan kedalam Sistem Referensi Koordinat (Coordinate Reference System) baru. Anda juga bisa menyimpan lapisan raster sebagai gambar (rendered), jadi jika Anda misalnya memiliki raster band tunggal yang telah menerapkan palet warna, Anda dapat menyimpan lapisan (layer) ke lapisan (layer) RGB ber-georeferensi.
- **Raster 2% cumulative cut by default**: Banyak produk raster citra memiliki sejumlah besar outlier menghasilkan gambar yang memiliki penampilan washed out. QGIS versi 2.0 memperkenalkan kontrol yang lebih baik atas proses rendering raster, termasuk menggunakan kumulatif 2% - 98% persen dipotong secara default ketika menentukan ruang warna gambar.
- **Identifikasi format WMS**: Memilih format mengidentifikasi hasil untuk lapisan (layer) WMS jika beberapa dikenal format yang didukung oleh server. Format yang didukung adalah HTML, fitur (GML) dan teks biasa. Jika format (GML) dipilih, hasilnya adalah dalam bentuk yang sama seperti untuk lapisan vektor, geometri dapat disorot dan fitur termasuk atribut dan geometri dapat disalin ke papan klip dan disisipkan ke lapisan lain.
- **Dukungan WMTS**: Klien WMS QGIS kini didukung WMTS (Web Mapping Tile Service) termasuk pemilihan sub-dataset seperti irisan waktu. Saat menambahkan lapisan (layer) WMS dari server compliant, Anda akan diminta untuk memilih tampilan irisan waktu.

5.3 Simbologi

- **Properti data yang didefinisikan**: Dengan properti data baru yang didefinisikan, memungkinkan untuk mengontrol jenis simbol, ukuran, warna, rotasi, dan banyak properti lain melalui fitur atribut.
- **Manajemen lapisan perbaikan simbol**: Simbol lapisan (layer) baru menggunakan gambaran jelas, dengan tata letak pohon-terstruktur yang memungkinkan untuk akses mudah dan cepat ke semua simbol lapisan (layer).
- **Dukungan transparansi dalam definisi warna**: Pada kebanyakan tempat dimana Anda memilih warna, kini QGIS memungkinkan Anda untuk menentukan alpha channel (menentukan harus seberapa transparan warna). Hal ini memungkinkan Anda membuat peta tampak hebat dan untuk menyembunyikan data dengan mudah bahwa Anda tidak ingin pengguna melihatnya.
- **Kontrol Warna Lapisan (layer) Raster**: QGIS versi 2.0 memungkinkan Anda secara tepat mengontrol persis bagaimana Anda ingin lapisan (layer) raster muncul. Anda kini memiliki kontrol penuh atas kecerahan (brightness), kontras (contrast) dan saturasi (saturation) lapisan (layer) raster. Bahkan ada pilihan tampilan raster skala abu-abu (grayscale) atau dengan warna tertentu.
- **Salin simbologi antar lapisan (layer)**: Sekarang sangat mudah menyalin simbologi dari satu lapisan (layer) ke lapisan lain. Jika Anda bekerja dengan beberapa lapisan yang sama, Anda bisa klik kanan pada salah satu lapisan, pilih Salin (Copy Style) dari menu utama dan kemudian klik-kanan pada layer lain dan memilih Tempel (Paste Style).
- **Cara menyimpan dalam basis data Anda**: Jika Anda menggunakan penyimpanan data basis data vektor, sekarang Anda cara penyimpanan definisi lapisan (layer) langsung dalam basis data. Hal ini membuat mudah untuk berbagi gaya lapisan (layer) dalam suatu perusahaan atau lingkungan multi-pengguna.
- **Dukungan warna landai (ramp)**: Warna landai (ramp) kini tersedia di banyak tempat pengaturan simbologi QGIS, set extensible warna landai (ramp). Anda juga dapat desain sendiri dan banyak tema cpt-kota yang termasuk dalam QGIS sekarang ‘out of the box’. Bahkan warna landai (ramp) didukung pengaturan transparansi!
- **Set custom default styles for all layer types**: Kini QGIS memungkinkan Anda mengontrol bagaimana lapisan (layer) baru akan ditarik ketika mereka tidak memiliki gaya (style) .qml. Anda juga dapat mengatur default tingkat transparansi untuk lapisan (layer) baru dan apakah simbol harus memiliki warna acak.

5.4 Penyusun Peta

- **Pokok-pokok Peta HTML**: Anda sekarang dapat menempatkan elemen html ke peta Anda.
- **Garis Bantu Otomatis**: Menyelaraskan item peta sangat penting untuk membuat peta dicetak dengan bagus. Garis bantu otomatis telah ditambahkan untuk memudahkan penyelarasan penyusun objek hanya dengan mendekatkan sebuah benda dengan yang lain.
- **Garis Bantu Manual**: Kadang-kadang Anda perlu untuk menyelaraskan objek dengan jarak tertentu pada penyusun peta. Dengan garis bantu manual, Anda dapat menambahkan garis bantu secara manual yang memungkinkan benda menyelaraskan lebih baik menggunakan keselarasan umum. Cukup tarik dari atas atau samping untuk menambahkan garis bantu baru.
- **Menghasilkan Serangkaian Peta**: Pernahkah diperlukan cara menghasilkan serangkaian peta? Tentu saja Anda membutuhkan. Sekarang dalam Penyusun Peta telah disediakan layanan menghasilkan serangkaian peta menggunakan fitur atlas. Cakupan lapisan (layer) bisa titik, garis, poligon, dan sekarang yang fitur data atribut tersedia dalam label untuk penggantian nilai data.
- **Dukungan banyak halaman (Multipage)**: Sebuah jendela penyusun peta tunggal kini dapat berisi lebih dari satu halaman.
- **Expressions in composer labels**: Item penyusun label pada versi 1,8 sangat terbatas dan hanya diperbolehkan tanda tunggal $CURRENT_DATE yang digunakan. Pada versi 2.0 telah ditambahkan dukungan ekspresi penuh dengan keleluasaan mengelola label akhir.
- **Dukungan tampilan otomatis dalam bingkai peta**: Perlu menunjukkan daerah saat ini pada bingkai peta utama di jendela tampilan yang lebih kecil. Sekarang, bingkai peta memiliki kemampuan untuk menunjukkan luasan dan akan memperbarui ketika pindah. Dengan menggunakan fitur pembuat atlas sekarang inti dalam penyusun peta memungkinkan untuk menghasilkan beberapa peta. Sekilas gaya bingkai menggunakan gaya yang sama sebagai objek peta poligon normal sehingga kreativitas Anda tidak pernah dibatasi.
- **Menggabung Lapisan (Layer blending)**: Menggabung lapisan memungkinkan untuk menggabungkan lapisan (layer) dalam cara-cara baru dan menarik. Sementara di versi lama, semua dapat Anda lakukan untuk membuat lapisan transparan, kini Anda dapat memilih seperti “multiply”, “darken only”, dan masih banyak lagi. Penggabungan (blending) dapat digunakan dalam tampilan peta normal maupun di penyusun peta cetak. Untuk panduan singkat tentang cara menggunakan penggabungan (blending) di penyusun peta cetak untuk membuat gambar latar belakang, lihat “Vintage map design using QGIS”.
- **Dukungan Label HTML**: Dukungan label HTML telah ditambahkan pada penyusun peta untuk memberikan kontrol yang lebih besar pada peta akhir Anda. Label HTML mendukung penuh lembar gaya css, html, dan bahkan javascript.
- **Legenda multi kolom**: Sekarang penyusun legenda telah didukung multi kolom. Memisahkan dari satu lapisan (layer) dengan banyak kelas menjadi beberapa kolom adalah opsional. Lapisan simbol tunggal ditambahkan secara default sebagai item baris tunggal. Tiga gaya yang berbeda dapat diberikan untuk lapisan/judul grup: Grup, sub grup atau tersembunyi (hidden). Gaya judul visual yang memungkinkan pengelompokan item dengan leluasa. Sebagai contoh, simbol lapisan tunggal dapat ditampilkan sebagai item baris tunggal atau dengan judul lapisan (seperti versi 1.8), simbol dari beberapa lapisan (layer) dapat dikelompokkan ke dalam satu kelompok (menyembunyikan judul) dll. Fitur penghitungan bisa ditambahkan ke label.
- **Pembaruan manajemen penyusun peta**: Perbaikan berikut telah dibuat untuk manajemen penyusun peta:
  - Sekarang nama penyusun dapat didefinisikan pada penciptaan, opsional memilih mulai dari nama penyusun lainnya
  - Sekarang penyusun bisa disalin/duplikasi
  - Baru dari Template dan dari Spesifik (dalam Manajer Penyusun) menciptakan penyusun dari template yang terletak di manapun pada filesystem
  - Sekarang proyek induk bisa disimpan secara langsung dari area kerja penyusun peta
  - Semua tindakan manajemen penyusun kini dapat diakses langsung dari area kerja penyusun peta

5.5 Pelabelan

- **Sistem pelabelan baru**: Sistem pelabelan telah benar-benar dirombak - kini mencakup banyak fitur baru seperti drop shadow, 'highway shields', banyak pilihan dan berbagai peningkatan kinerja. Kami perlahan-lahan melakukan jauh dari sistem 'label tua', meskipun Anda masih menemukan fungsi yang tersedia untuk rilis ini, Anda berharap bahwa itu akan hilang dalam rilis tindak lanjut.
- **Expression based label properties**: Kekuatan penuh label dan aturan ekspresi yang normal kini dapat digunakan untuk properti label. Hampir setiap properti dapat didefinisikan dengan nilai ekspresi atau kolom nilai memberikan Anda kontrol lebih besar atas hasil label. Ekspresi dapat merujuk ke kolom (misalnya mengatur ukuran font dengan nilai 'huruf') atau dapat mencakup logika yang lebih kompleks.
- **Mesin pelabelan yang usang**: Penggunaan mesin pelabelan tua tersedia dalam QGIS <= versi 1.8 kini sudah usang, namun belum dihapus. Hal ini untuk pengguna bermigrasi dari proyek yang lama ke mesin label baru. Berikut ini panduan bekerja dengan mesin yang lebih tua di QGIS versi 2.0:
  - Tab pelabelan lama dihapus dari properti lapisan (layer) vektor dialog untuk proyek-proyek baru atau proyek tua yang dibuka jangan menggunakan mesin pelabelan.
  - Tab usang tetap aktif untuk proyek-proyek tua yang dibuka, jika setiap lapisan (layer) menggunakan mereka, dan masih ada bahkan jika menyimpan proyek tanpa lapisan memiliki mesin pelabelan tua yang diaktifkan.
  - Tab pelabelan Usang dapat diaktifkan/dinonaktifkan untuk proyek ini, melalui konsol perintah Python. Harap dicatat: Ada kemungkinan besar mesin pelabelan usang akan benar-benar dihapus sebelum rilis stabil berikutnya QGIS. Silakan bermigrasi proyek lebih lama.

5.6 Programmability

- **Konsol Python Baru**: Konsol Python baru memberi Anda kekuatan bahkan lebih. Kini dengan dukungan pengaturan otomatis lengkap, syntax highlighting, adjustable font. Penyunting kode memungkinkan masuk lebih mudah kode blok yang lebih besar dengan kemampuan membuka dan menjalankan berkas Python dalam sesi QGIS.
- **Fungsi Ekspresi**: Dengan mesin ekspresi yang digunakan lebih banyak dan QGIS memungkinkan hal-hal seperti ekspresi berbasis label dan simbol, lebih banyak fungsi telah ditambahkan ke pembangun ekspresi dan semuanya dapat diakses melalui pembangun ekspresi. Semua fungsi termasuk bantuan yang komprehensif dan panduan penggunaan untuk kemudahan penggunaan.
- **Custom expression functions**: Jika mesin ekspresi tidak memiliki fungsi yang Anda butuhkan. Jangan khawatir, fungsi baru bisa ditambahkan melalui plugin menggunakan API Python.
- **Pembersih API Python**: API Python telah dirubah lebih bersih, lebih pythonic, pengalaman pemrograman. API V2 QGIS 2.0 menggunakan SIP yang menghilangkan logika berantakan toString(), toInt() yang dibutuhkan saat bekerja dengan nilai-nilai. Jenis kini diubah menjadi jenis Python asli untuk membuat API yang jauh lebih baik. Akses atribut kini dilakukan pada fitur itu sendiri menggunakan kunci pencarian sederhana, indeks pencarian dan atribut peta.
- **Code compatibility with version 1.x releases**: Ini adalah rilis utama, tidak sepenuhnya API kompatibel dengan rilis sebelum 1.x. Dalam kebanyakan kasus port kode Anda harus cukup jelas - Anda dapat menggunakan panduan ini untuk memulai. Silakan memanfaatkan mailing list pengembang, jika Anda membutuhkan bantuan.
- **Python project macros**: Modul Python tersimpan di dalam berkas project.qgs, dapat dimuat dan menjalankan fungsi khusus pada proyek berikut: openProject(), saveProject() and closeProject(). Macro yang dijalankan dapat dikonfigurasi dalam pilihan aplikasi.

5.7 Alat Analisis

- **Processing Commander**: Untuk akses cepat ke fungsi geoprocessing, cukup menjalankan perintah pengolahan (Ctrl + Alt + M) dan mulai mengetik nama alat yang Anda cari. Perintah akan menunjukkan pilihan yang tersedia dan menjalankan mereka untuk Anda. Tidak ada lagi cara mencari melalui menu untuk menemukan alat (tool). Sekarang ada di ujung jari Anda.
- **Heatmap Plugin Improvements**: Plugin heatmap telah dilakukan banyak perbaikan dan optimisasi, sehingg dalam pembuatan hasilnya lebih cepat. Selain itu, Anda sekarang memiliki pilihan fungsi kernel yang digunakan untuk membuat heatmap.
- **Dukungan Pengolahan (Processing Support)**: Proyek SEXTANTE telah dimasukkan ke QGIS sebagai fungsi inti. SEXTANTE telah diubah namanya menjadi 'Pengolahan' dan memperkenalkan menu baru di QGIS dimana Anda dapat mengakses kotak alat (toolbox) alat analisis spasial. Kotak alat (toolbox) pengolahan memiliki fungsi sangat kaya - dengan pemrograman API python memungkinkan Anda menambahkan alat-alat baru, dan kait (hooks) menyediakan akses ke kemampuan banyak alat analisis populer open source seperti GRASS, OTB, SAGA dll.
- **Pengolahan Modeller (Processing Modeller)**: Salah satu fitur besar dari kerangka pengolahan baru adalah kemampuan untuk menggabungkan alat-alat grafis. Menggunakan Pengolahan Modeller, Anda dapat membangun analisis kompleks dari serangkaian kecil modul. Anda dapat menyimpan model ini dan kemudian menggunakannya dalam model yang lebih kompleks. Mengagumkan daya terintegrasi langsung ke QGIS dan sangat mudah digunakan!

5.8 Plugin

- **Revamped plugin manager**: Pada QGIS 1.x mengelola plugin dengan dua antarmuka agak membingungkan - satu untuk mengelola plugin terpasang dan satu untuk mengambil plugin python dari repositori Plugin. Pada QGIS versi 2.0 kami memperkenalkan baru, bersatu, pengelola Plugin yang menyediakan one stop shop untuk mengunduh, mengaktifkan/menonaktifkan dan umumnya mengelola plugin Anda. Oh, dan antar muka pengguna cantik dengan tab sisi dan mudah untuk mengenali ikon!
- **Pilihan Aplikasi dan Proyek**: Tentukan default proyek startup dan proyek template. Dengan QGIS 2.0 Anda dapat menentukan apa QGIS harus lakukan ketika mulai: Proyek Baru (legacy behaviour, dimulai dengan proyek kosong), Terbaru (ketika Anda mulai QGIS akan memuat proyek terakhir yang Anda kerjakan), Spesifik (selalu memuat proyek tertentu ketika QGIS dimulai). Anda dapat menggunakan direktori proyek template untuk menentukan di mana proyek template Anda harus disimpan. Setiap proyek yang Anda simpan di direktori akan tersedia untuk digunakan sebagai template saat *Proyek* → *Baru* dari menu template.
- **System environment variables**: Lingkungan sistem variabel saat ini dapat dilihat dan banyak konfigurasi dalam dialog pilihan aplikasi. Berguna untuk platform seperti Mac, di mana aplikasi GUI tidak selalu mewarisi lingkungan pengguna shell. Juga berguna untuk mengatur / melihat lingkungan variabel untuk set alat eksternal dikendalikan oleh pengolahan kotak alat, seperti SAGA, GRASS; dan, untuk mengaktifkan keluaran debugging untuk bagian tertentu dari sumber kode.
- **Skala pembesaran user-defined**: Sebuah daftar skala pembesaran kini dapat dikonfigurasi untuk aplikasi dan pilihan override per proyek. Daftar ini akan muncul Skala kotak combo dalam jendela utama status bar, akses cepat ke skala yang dikenal untuk efisiensi bekerja dengan sumber data saat ini. Skala dapat diekspor ke berkas XML yang dapat diimpor ke proyek-proyek lain atau aplikasi QGIS lain.

5.9 Umum

- **Quantum GIS sekarang dikenal sebagai |qg|**: 'Quantum' dalam 'Quantum GIS' tidak pernah punya makna khusus dan dualitas mengacu pada proyek kami baik sebagai Quantum GIS dan QGIS menyebabkan beberapa kebingungan. Kami merampingkan proyek kami dan sebagai bagian dari proses kita secara resmi menjatuhkan penggunaan kata Quantum - selanjutnya kita akan dikenal hanya sebagai QGIS (dieja dengan semua huruf dalam huruf besar). Kami akan memperbarui semua kode kita dan bahan publikasi untuk mencerminkan hal ini.

5.10 Legenda Pelapis (layer)

- **Legenda umpan balik dan pilihan visual**
  - Jumlah total untuk fitur pada lapisan (layer), serta per simbol
  - Lapisan (layer) vektor dalam mode sunting, kini memiliki ikon pensil merah untuk menunjukkan proses (belum disimpan) suntingan
  - Lapisan (layer) yang aktif sekarang digarisbawahi, untuk menunjukkan itu pilihan dalam lapisan (layer) banyak atau ketika tidak ada pilihan
  - Mengklik di spasi non-list-item sekarang membersihkan seleksi
  - Klik kanan (Right-clicks) sekarang diperlakukan sebagai klik kiri (left-click) sebelum menampilkan menu utama, memungkinkan untuk satu kali klik bukan dua
  - Kelompok dan lapisan (layer) dapat opsional dengan huruf tebal
  - Ikon pratinjau lapisan (layer) raster yang dihasilkan sekarang dapat dimatikan, untuk proyek-proyek di mana render tersebut mungkin berjalan lambat
- **Duplicate existing map layer**: Duplikat lapisan (layer) vektor dan raster dipilih dalam legenda lapisan peta. Mirip dengan mengimpor sumber data yang sama lagi, sebagai lapisan (layer) yang terpisah, lalu salin/tempel dan atribut simbologi.
- **Multi-layer toggle editing commands**: Pengguna sekarang dapat memilih beberapa lapisan (layer) dalam legenda dan jika salah satu dari mereka adalah lapisan (layer) vektor dalam mode sunting, pilih untuk menyimpan (save), atau rollback, atau membatalkan (cancel) suntingan saat ini. Pengguna juga dapat memilih untuk menerapkan tindakan-tindakan di semua lapisan, terlepas dari seleksi.

5.11 Peramban

- **Improvements to in-app browser panel**:
  - Direktori dapat disaring oleh wildcard atau ekspresi regex
  - Rumah Proyek baru (direktori induk dari proyek saat ini)
  - Lihat properti direktori yang dipilih dalam dialog
  - Pilih direktori untuk memindai cepat
  - Pilih tambah direktori langsung ke Favorit melalui dialog peramban filesystem
  - /Volumes baru pada Mac (direktori tersembunyi untuk akses ke drive eksternal)
  - Grup OWS baru (pengumpulan koneksi server peta yang tersedia)
  - Buka peramban kedua (*Lihat -> Panel -> Peramban (2)*) untuk interaksi drag-n-drop antara panel peramban
  - Saat ini ikon disaring berdasarkan tipe grup (filesystem, basis data, server peta)
  - Saat ini properti lapisan (layer) memiliki visual layout lebih baik

BAB 6

Memulai

Bab ini memberikan gambaran singkat cara memasang QGIS, beberapa contoh data dari QGIS halaman web dan menjalankan sesi pertama memvisualisasikan lapisan (layer) raster dan vektor sederhana.

6.1 Pemasangan (Instalasi)

Pemasangan QGIS sangat sederhana. Standar paket installer tersedia untuk MS Windows dan Mac OS X. Tersedia paket binary GNU/Linux (rpm dan deb) atau repositori perangkat lunak untuk menambah manajer instalasi. Dapatkan informasi terakhir paket binari pada website QGIS http://download.qgis.org.

6.1.1 Pemasangan dari sumber

Jika Anda perlu membangun QGIS dari sumber, silakan lihat petunjuk instalasi. Mereka didistribusikan dengan kode sumber QGIS dalam sebuah berkas yang bernama 'INSTALL'. Anda juga bisa menemukannya di dalam jaringan (online) di http://htmlpreview.github.io/?https://raw.github.com/qgis/QGIS/master/doc/INSTALL.html

6.1.2 Pemasangan pada media eksternal

QGIS memungkinkan untuk menentukan opsi `--configpath` yang menimpa path default (misal di linux ~/.qgis2) untuk konfigurasi pengguna dan QSettings menggunakan direktori ini juga. Hal ini memungkinkan pengguna yang membawa installer QGIS pada flash drive bersama dengan semua plugin dan pengaturan. Bandingkan dengan bagian *Menu Sistem*.

6.2 Contoh data

Panduan pengguna berisi contoh-contoh berdasarkan contoh dataset QGIS.

installer Windows memiliki pilihan untuk mengunduh contoh dataset QGIS. Jika dicentang, data akan diunduh ke folder `My Documents` Anda dan ditempatkan dalam folder bernama `GIS database`. Anda dapat menggunakan Windows Explorer untuk memindahkan folder ini ke setiap lokasi yang nyaman. Jika Anda tidak memilih kotak centang untuk memasang contoh dataset selama instalasi QGIS, Anda dapat

- menggunakan data GIS yang Anda miliki;
- unduh contoh data di http://download.osgeo.org/qgis/data/qgis_sample_data.zip; atau
- hapus (uninstall) QGIS dan memasang ulang dengan opsi unduh data, hanya jika solusi di atas tidak berhasil.

🐧 X untuk GNU/Linux dan Mac OSX belum ada paket instalasi dataset yang tersedia sebagai rpm, deb atau dmg. Untuk menggunakan contoh dataset unduh berkas ZIP `qgis_sample_data` di http://download.osgeo.org/qgis/data/qgis_sample_data.zip dan ekstrak arsip ZIP di sistem Anda. Dataset Alaska mencakup semua data GIS yang digunakan sebagai contoh dan cuplikan layar di buku panduan, dan termasuk basis data kecil GRASS. Proyeksi contoh dataset QGIS adalah Alaska Albers Equal Area dengan satuan kaki (feet). Kode EPSG 2964.

```
PROJCS["Albers Equal Area",
    GEOGCS["NAD27",
        DATUM["North_American_Datum_1927",
            SPHEROID["Clarke 1866",6378206.4,294.978698213898,
                AUTHORITY["EPSG","7008"]],
            TOWGS84[-3,142,183,0,0,0,0],
            AUTHORITY["EPSG","6267"]],
        PRIMEM["Greenwich",0,
            AUTHORITY["EPSG","8901"]],
        UNIT["degree",0.0174532925199433,
            AUTHORITY["EPSG","9108"]],
        AUTHORITY["EPSG","4267"]],
    PROJECTION["Albers_Conic_Equal_Area"],
    PARAMETER["standard_parallel_1",55],
    PARAMETER["standard_parallel_2",65],
    PARAMETER["latitude_of_center",50],
    PARAMETER["longitude_of_center",-154],
    PARAMETER["false_easting",0],
    PARAMETER["false_northing",0],
    UNIT["us_survey_feet",0.3048006096012192]]
```

Jika Anda berniat untuk menggunakan frontend QGIS sebagai grafis GRASS, Anda dapat menemukan pilihan contoh lokasi (misalnya Spearfish atau South Dakota) di situs resmi GRASS GIS http://grass.osgeo.org/download/sample-data/.

6.3 Sesi Contoh

Sekarang Anda QGIS sudah terpasang dan contoh dataset tersedia, kami ingin menunjukkan sesi contoh QGIS singkat dan sederhana. Kami akan memvisualisasikan lapisan (layer) raster dan vektor. Kami akan menggunakan lapisan (layer) raster tutupan lahan `qgis_sample_data/raster/landcover.img` dan lapisan (layer) vektor danau `qgis_sample_data/gml/lakes.gml`.

6.3.1 Mulai QGIS

- Mulai QGIS dengan mengetik: "QGIS" di terminal, atau menggunakan bineri precompiled, menggunakan menu Aplikasi.
- Mulai QGIS menggunakan menu Start atau shortcut desktop, atau dobel klik di berkas proyek QGIS.
- Dobel klik ikon pada folder Aplikasi.

6.3.2 Muat lapisan (layer) raster dan vektor dari contoh dataset

1. Klik di ikon Load Raster
2. Lihat ke folder `qgis_sample_data/raster/`, pilih berkas ERDAS Img `landcover.img` dan klik **[Buka]**.
3. Jika berkas tidak ada dalam daftar, periksa apakah combobox jenis berkas di bagian bawah dialog diatur pada jenis yang tepat, dalam kasus ini "Erdas Imagine Images (`*.img`, `*.IMG`)".
4. Sekarang klik di ikon Load Vector.
5. ● *Berkas* harus dipilih sebagai Jenis Sumber baru *Tambah Lapisan Vektor*. Sekarang klik **[Lihat]** untuk memilih lapisan (layer) vektor.

6. Lihat ke folder `qgis_sample_data/gml/`, pilih “GML” dari combobox jenis berkas, kemudian pilih berkas GML `lakes.gml` dan klik **[Buka]**, kemudian di dialog Tambah Vektor klik **[OK]**.
7. Perbesar sedikit ke daerah favorit Anda dengan beberapa danau.
8. Dobel klik lapisan (layer) `lakes` di legenda peta untuk membuka dialog *Properti*.
9. Klik menu *Style* dan pilih biru pada isian warna.
10. Klik menu *Label* dan centang ☑ *Label lapisan ini dengan* kotak centang untuk mengaktifkan label dan memilih bidang “NAMES” sebagai bidang isian label.
11. Untuk memudahkan pembacaan label, Anda dapat menambahkan penyangga (buffer) putih di sekitar mereka, dengan klik “Buffer” dalam daftar sebelah kiri, periksa ☑ *Draw text buffer* dan pilih 3 sebagai ukuran penyangga (buffer).
12. Klik **[Terapkan]**, periksa apakah hasilnya baik dan terakhir klik **[OK]**.

Anda dapat melihat betapa mudahnya untuk memvisualisasikan lapisan (layer) raster dan vektor dalam QGIS. Mari kita lanjutkan ke bagian berikut untuk mempelajari lebih lanjut tentang fungsi, fitur dan pengaturan yang tersedia dan bagaimana menggunakannya.

6.4 Memulai dan Menghentikan QGIS

Di bagian *Sesi Contoh* Anda sudah belajar bagaimana memulai QGIS. Kami akan mengulanginya di sini dan Anda akan melihat QGIS juga menyediakan opsi baris perintah lebih lanjut.

- Dengan asumsi bahwa QGIS dipasang di PATH, Anda dapat memulai QGIS dengan mengetik: `qgis` pada terminal atau dengan mengklik dobel pada link aplikasi QGIS (atau shortcut) pada desktop atau dalam menu aplikasi.
- Mulai QGIS menggunakan menu Start atau shortcut dekstop, atau dobel klik pada berkas proyek QGIS.
- Dobel klik ikon di folder Aplikasi Anda. Jika Anda memulai QGIS di terminal, jalankan /path-to-installation-executable/Contents/MacOS/Qgis.

Untuk menghentikan QGIS, klik menu *Berkas* *QGIS* → *Keluar*, atau menggunakan shortcut `Ctrl+Q`.

6.5 Pilihan Baris Perintah

QGIS mendukung sejumlah pilihan ketika dimulai dari baris perintah. Untuk mendapatkan daftar opsi, enter `qgis --help` pada baris perintah. Pernyataan penggunaan untuk QGIS adalah:

```
    qgis --help
    QGIS - 2.0.1-Dufour 'Dufour' (exported)
QGIS is a user friendly Open Source Geographic Information System.
    Usage: qgis [OPTION] [FILE]
      options:
        [--snapshot filename]          emit snapshot of loaded datasets to given file
        [--width width]                width of snapshot to emit
        [--height height]              height of snapshot to emit
        [--lang language]              use language for interface text
        [--project projectfile]        load the given QGIS project
        [--extent xmin,ymin,xmax,ymax] set initial map extent
        [--nologo]                     hide splash screen
        [--noplugins]                  don't restore plugins on startup
        [--nocustomization]            don't apply GUI customization
        [--optionspath path]           use the given QSettings path
        [--configpath path]            use the given path for all user configuration
        [--code path]          run the given python file on load
        [--help]                        this text

    FILES:
      Files specified on the command line can include rasters,
      vectors, and QGIS project files (.qgs):
      1. Rasters - Supported formats include GeoTiff, DEM
         and others supported by GDAL
      2. Vectors - Supported formats include ESRI Shapefiles
         and others supported by OGR and PostgreSQL layers using
         the PostGIS extension
```

Tip: Contoh Menggunakan argumen baris perintah

Anda dapat memulai QGIS dengan menentukan satu atau lebih berkas data pada baris perintah. Misalnya, dengan asumsi Anda berada di direktori qgis_sample_data, Anda bisa memulai QGIS dengan berkas lapisan vektor dan raster diatur untuk dimuat pada startup dengan menggunakan perintah berikut: `qgis ./raster/landcover.img ./gml/lakes.gml`

Pilihan baris perintah `--snapshot`

Pilihan ini memungkinkan Anda untuk membuat cuplikan layar dalam format PNG dari tampilan saat ini. Hal ini sangat berguna ketika Anda memiliki banyak proyek dan ingin menghasilkan cuplikan layar dari data Anda.

Saat ini menghasilkan berkas PNG dengan piksel 800x600. Hal ini dapat diadaptasi dengan menggunakan argumen baris perintah `--width` dan `--height`. Nama berkas bisa ditambahkan setelah `--snapshot`.

Pilihan baris perintah `--lang`

Berdasarkan QGIS lokal Anda, pilih lokalisasi yang benar. Jika Anda ingin mengubah bahasa, Anda dapat menentukan kode bahasa. Sebagai contoh: `--lang=id` QGIS dimulai menggunakan lokal Indonesia. Daftar bahasa saat ini yang didukung dengan kode bahasa dan status disediakan di http://hub.qgis.org/wiki/quantum-gis/GUI_Translation_Progress

Baris perintah `--project`

Memulai QGIS dengan berkas proyek yang sudah ada. Hanya tambahkan baris perintah `--project` ikuti nama berkas proyek yang akan dibuka dan QGIS akan membukanya dengan memuat semua lapisan (layer).

Baris perintah `--extent`

Untuk memulai dengan peta batas tertentu menggunakan opsi ini. Anda perlu menambahkan kotak bounding sejauh Anda dalam urutan dipisahkan oleh koma:

```
--extent xmin,ymin,xmax,ymax
```

Baris perintah `--nologo`

Argumen baris perintah ini menyembunyikan layar splash ketika Anda mulai QGIS.

Baris perintah `--noplugins`

Jika Anda mengalami kesulitan pada saat startup dengan plugin, Anda dapat menghindari beban mereka pada saat startup. Mereka masih akan tersedia di Pengelola Plugin after-wards.

Baris perintah `--nocustomization`

Menggunakan argumen baris perintah ini kustomisasi GUI yang ada tidak akan diterapkan pada saat startup.

Baris perintah `--optionspath`

Anda dapat memiliki beberapa konfigurasi dan memutuskan mana yang akan digunakan ketika memulai QGIS menggunakan opsi ini. Lihat *Opsi* untuk memeriksa sistem operasi mana menyimpan berkas pengaturan. Saat ini tidak ada cara untuk menentukan berkas yang mana untuk menulis pengaturan, oleh karena itu, Anda dapat membuat salinan pengaturan berkas asli dan ganti namanya.

Baris perintah `--configpath`

Pilihan ini mirip dengan yang di atas, tapi selanjutnya menimpa path default (~/.qgis) untuk konfigurasi pengguna dan QSettings untuk menggunakan direktori ini juga. Hal ini memungkinkan pengguna mis membawa instalasi QGIS pada flash drive bersama dengan semua plugin dan pengaturan.

6.6 Proyek

Sesi QGIS Anda dianggap sebagai Project. QGIS bekerja pada satu proyek pada satu waktu. Pengaturan yang baik dianggap sebagai per-proyek, atau sebagai default untuk proyek-proyek baru (lihat Bagian *Opsi*). QGIS dapat menyimpan kerja Anda ke dalam sebuah berkas proyek dengan menggunakan pilihan menu *Proyek* → *Simpan* atau *Proyek* → *Simpan Sebagai*.

Memuat proyek tersimpan ke dalam sesi QGIS menggunakan *Proyek* → *Buka ...*, *Project* → *Baru dari template* atau *Proyek* → *Buka yang baru teradi*.

Jika Anda ingin membersihkan sesi Anda dan memulai baru lagi, pilih *Proyek* → *Baru*. Pilihan menu ini akan meminta Anda untuk menyimpan proyek yang telah ada jika perubahan yang telah dibuat sejak dibuka atau yang terakhir disimpan.

Jenis-jenis informasi yang disimpan dalam berkas proyek meliputi:

- Lapisan (layer) yang ditambahkan
- Properti lapisan (layer), termasuk simbolisasi
- Proyeksi untuk tampilan peta
- Tampilan terkahir

Berkas proyek disimpan dalam format XML, sehingga memungkinkan untuk mengedit berkas diluar QGIS jika Anda tahu apa yang Anda lakukan. Format berkas telah diperbaharui beberapa kali dibanding versi QGIS sebelumnya. Berkas proyek dari versi QGIS yang lebih tua mungkin tidak bekerja dengan baik lagi. Harus dibuat sadar akan hal ini, di *Umum* tab under *Pengaturan* → *Opsi* Anda dapat memilih:

☑ *Prompt untuk menyimpan proyek dan perubahan sumber data bila diperlukan*

☑ *Peringatkan ketika membuka berkas proyek QGIS yang disimpan dengan versi lama*

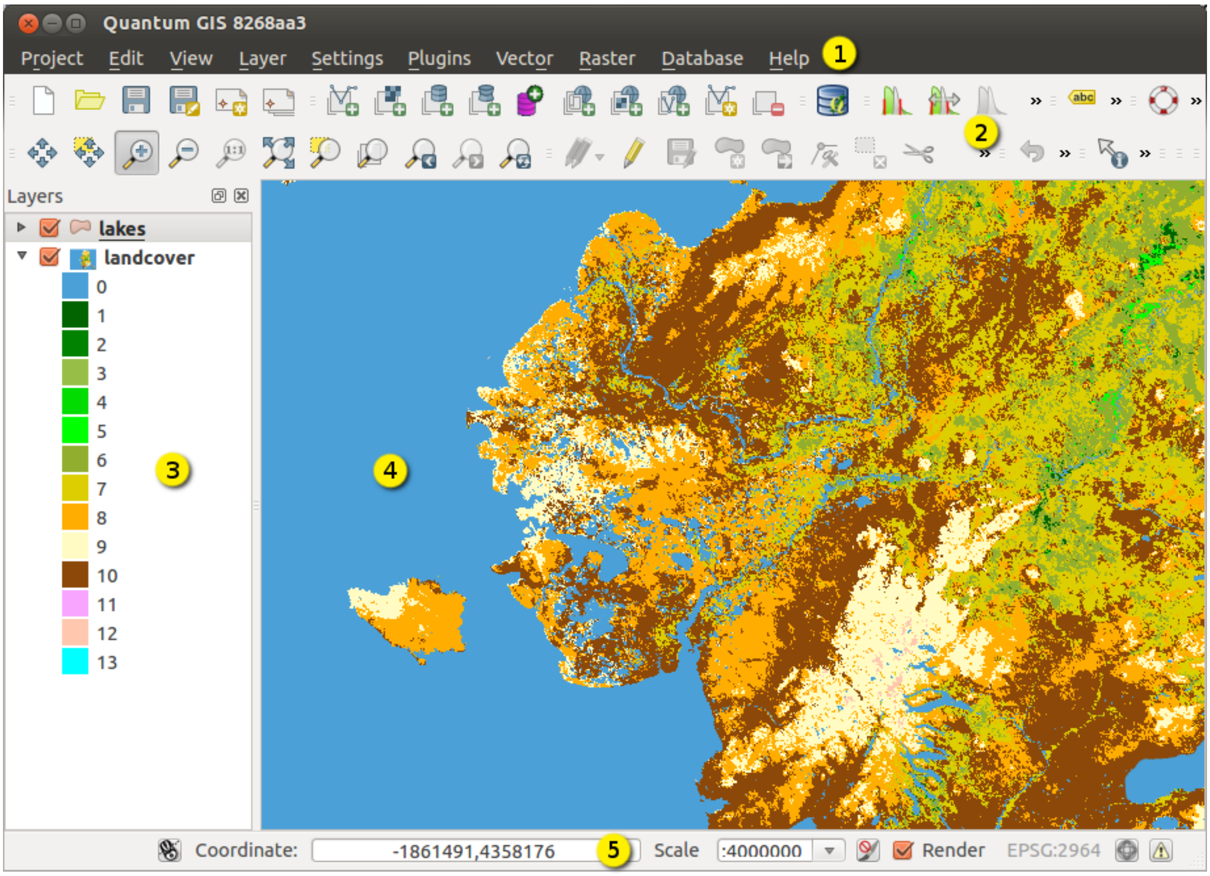
6.7 Keluaran (Output)

Ada beberapa cara untuk menghasilkan keluaran (output) dari sesi QGIS Anda. Kita telah membahasnya pada Bagian *Proyek* menyimpan berkas proyek. Berikut ini adalah contoh cara lain untuk menghasilkan keluaran (output) berkas:

- Menu opsi *Proyek* → Simpan sebagai Gambar membuka dialog berkas di mana Anda memilih nama, path dan jenis gambar (format PNG atau JPG). Sebuah berkas dengan ekstensi PNGW atau JPGW disimpan dalam folder sama dengan gambar yang mempunyai georeferensi.
- Menu opsi *Proyek* → *Penyusun Cetak Baru* membuka dialog di mana Anda dapat me-layout dan mencetak kanvas peta saat ini (lihat Bagian *Print Composer*).

QGIS GUI

Ketika QGIS dimulai, Anda akan disajikan tampilan GUI seperti gambar dibawah ini (nomer 1 sampai 5 dalam lingkaran kuning mengacu pada 5 area utama antarmuka yang dibahas dibawah ini:


Quantum GIS 8268aa3
Project
Edit
View
Layer
Settings
Plugins
Vector
Raster
Database
Help
1
2
Layers
lakes
landcover
0
1
2
3
4
5
6
7
8
9
10
11
12
13
3
4
5
Render
EPSG:2964

Coordinate: -1861491,4358176

Scale :4000000

Gambar 7.1: GUI QGIS dengan contoh data Alaska 🐧

Catatan: Jendela dekorasi Anda (judul bar , dll) dapat terlihat berbeda tergantung pada sistem operasi dan window manager Anda .

GUI QGIS dibagi dalam lima area:

1. Bar Menu
2. Bar Tool
3. Legenda Peta

4. Tampilan Peta
5. Status Bar

Kelima komponen antarmuka QGIS dijelaskan secara lebih rinci dalam bagian berikut. Lebih dari dua bagian dijelaskan di shortcut papan ketik dan bantuan.

7.1 Bar Menu

Menu bar memberikan akses ke berbagai fitur QGIS menggunakan standar hirarki menu. Menu-menu utama dan ringkasan dari beberapa menu pilihan yang tercantum di bawah ini, bersama-sama dengan ikon dari alat yang sesuai seperti yang ditampilkan pada toolbar, seperti shortcut papan ketik. Shortcut papan ketik juga dapat dikonfigurasi secara manual (shortcut yang disajikan dalam bagian ini adalah standar), menggunakan alat [**Konfigurasi Shortcut**] dalam menu *Pengaturan*.

Meskipun sebagian besar pilihan menu memiliki alat yang sesuai dan sebaliknya, menu tidak terorganisir seperti toolbar. Toolbar yang berisi alat ini bisa terdaftar setelah setiap pilihan menu diisi pada kotak centang. Beberapa pilihan menu hanya muncul jika plugin yang sesuai dimuat. Untuk informasi lebih lanjut tentang alat dan toolbar, lihat Bagian *Toolbar*.

7.1.1 Proyek

Pilihan Menu	Shortcut	Referensi	Toolbar
Baru	`Ctrl+N`	lihat *Proyek*	*Proyek*
Buka	`Ctrl+O`	lihat *Proyek*	*Proyek*
Baru dari template →		lihat *Proyek*	*Proyek*
Buka terkahir dikerjakan →		lihat *Proyek*	
Simpan	`Ctrl+S`	lihat *Proyek*	*Proyek*
Simpan sebagai	`Ctrl+Shift+S`	lihat *Proyek*	*Proyek*
Simpan sebagai Gambar		lihat *Keluaran (Output)*	
Penyusun cetak baru	`Ctrl+P`	lihat *Print Composer*	*Proyek*
Manajer Penyusun ...		lihat *Print Composer*	*Proyek*
Penyusun Cetak →		lihat *Print Composer*	
Keluar |qg|	`Ctrl+Q`		

7.1.2 Edit

Pilihan Menu	Shortcut	Referensi	Toolbar
Kembali	`Ctrl+Z`	lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Ulangi	`Ctrl+Shift+Z`	lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Ambil Fitur	`Ctrl+X`	lihat *Digitizing an existing layer*	*Digitalisasi*
Salin Fitur	`Ctrl+C`	lihat *Digitizing an existing layer*	*Digitalisasi*
Tempel Fitur	`Ctrl+V`	lihat *Digitizing an existing layer*	*Digitalisasi*
Tambah Fitur	`Ctrl+.`	lihat *Digitizing an existing layer*	*Digitalisasi*
Pindah Fitur		lihat *Digitizing an existing layer*	*Digitalisasi*
Hapus yand dipilih		lihat *Digitizing an existing layer*	*Digitalisasi*
Rotasi Fitur		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Sederhanakan Fitur		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Tambah Ring		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Tambah Bagian		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Hapus Ring		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Hapus bagian		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Bentuk Ulang Fitur		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Offset Curves		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Pisah Fitur		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Gabung Fitur Terpilih		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Gabung Attr. Fitur Terpilih		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*
Node Tool		lihat *Digitizing an existing layer*	*Digitalisasi*
Rotasi Simbol Titik		lihat *Advanced digitizing*	*Digitalisasi Lanjutan*

Setelah mengaktifkan mode Toggle mengedit untuk lapisan (layer), Anda menemukan ikon `Add Feature` di menu *Edit* tergantung pada jenis lapisan (titik, garis atau poligon).

7.1.3 Edit (ekstra)

Pilihan Menu	Shortcut	Referensi	Toolbar
Tambah Fitur		lihat *Digitizing an existing layer*	*Digitalisasi*
Tambah Fitur		lihat *Digitizing an existing layer*	*Digitalisasi*
Tambah Fitur		lihat *Digitizing an existing layer*	*Digitalisasi*

7.1.4 Tampilan

Pilihan Menu	Shortcut	Referensi	Toolbar
Pan Peta			*Navigasi Peta*
Geser Peta untuk Menyeleksi			*Navigasi Peta*
Perbesar	`Ctrl++`		*Navigasi Peta*
Perkecil	`Ctrl+-`		*Navigasi Peta*
Pilih →		lihat *Pilih dan lepas fitur*	*Atribut*
Identifikasi Fitur	`Ctrl+Shift+I`		*Atribut*
Mengukur →		lihat *Mengukur*	*Atribut*
Perbesar semua	kbd:*Ctrl+Shift+F*		*Navigasi Peta*
Perbesar ke lapisan			*Navigasi Peta*
Perbesar yang diseleksi	`Ctrl+J`		*Navigasi Peta*
Perbesaran Terakhir			*Navigasi Peta*
Perbesar Selanjutnya			*Navigasi Peta*
Perbesar Ukuran Aktual			*Navigasi Peta*
Dekorasi →		lihat *Dekorasi*	
Informasi Peta			*Atribut*
Bookmark Baru	`Ctrl+B`	lihat *Bookmark Spasial*	*Atribut*
Lihat Bookmarks	`Ctrl+Shift+B`	lihat *Bookmark Spasial*	*Atribut*
Refresh	`Ctrl+R`		*Navigasi Peta*

7.1.5 Lapisan

Pilihan Menu	Shortcut	Referensi
Baru →		lihat *Creating new Vector layers*
Lekatkan Lapisan dan Grup ...		lihat *Proyek-proyek Nesting*
Tambah Lapisan Vektor	kbd:*Ctrl+Shift+V*	lihat *Pekerjaan dengan Data Vektor*
Tambahkan Lapisan Raster	`Ctrl+Shift+R`	lihat *Loading raster data in QGIS*
Tambah Lapisan PostGIS	`Ctrl+Shift+D`	lihat *PostGIS Layers*
Tambahkan Lapisan SpatiaLite	`Ctrl+Shift+L`	lihat *SpatiaLite Layers*
Tambahkan Lapisan MSSQL Spasial	`Ctrl+Shift+M`	lihat *label_mssql*
Tambah Lapisan Oracle GeoRaster		lihat *Oracle GeoRaster Plugin*
Tambah Lapisan SQL Anywhere		Lihat *Plugin SQL Anywhere*
Tambah Lapisan WMS/WMTS	`Ctrl+Shift+W`	lihat *WMS/WMTS Client*
Tambah Lapisan WCS		lihat *WCS Client*
Tambah Lapisan WFS		lihat *WFS and WFS-T Client*
Tambahkan Lapisan Delimited Teks		lihat *Menambahkan Lapisan Teks Delimited (Delimited Text Lay*
Gaya Salin		lihat *Style Menu*
Gaya Tempel		lihat *Style Menu*

Lanjut ke

Tabel 7.1 – lanjutan dari halaman sebelumnya

Pilihan Menu	Shortcut	Referensi
Buka Tabel Atribut		lihat *Working with the Attribute Table*
Toggle Mengedit		lihat *Digitizing an existing layer*
Simpan Lapisan diedit		lihat *Digitizing an existing layer*
Diedit Sekarang →		lihat *Digitizing an existing layer*
Simpan Sebagai...		
Simpan terpilih sebagai berkas vektor...		Lihat *Working with the Attribute Table*
Buang Lapisan	`Ctrl+D`	
Atur CRS Lapisan	`Ctrl+Shift+C`	
Atur CRS proyek dari Lapisan		
Properti		
Query...		
Pelabelan		
Tambahkan ke Overview	`Ctrl+Shift+O`	
Tambahkan Semua ke Overview		
Menghapus Semua dari Overview		
Lihat Semua Lapisan	`Ctrl+Shift+U`	
Sembunyikan Semua Lapisan	`Ctrl+Shift+H`	

7.1.6 Pengaturan

Pilihan Menu	Shortcut	Referensi	Toolbar
Panel →		Lihat *Panel dan Toolbar*	
Toolbar →		Lihat *Panel dan Toolbar*	
Toggle Mode Layar Penuh	`Ctrl-F`		
Proyek Properti ...	`Ctrl+Shift+P`	lihat *Proyek*	
Ubah CRS ...		lihat *Custom Coordinate Reference System*	
Pengelola Gaya...		lihat *vector_style_manager*	
Konfigurasi shortcut ...			
Kustomisasi ...		lihat *Penyesuaian (Customization)*	
Opsi ...		lihat *Opsi*	
Opsi Snapping ...			

7.1.7 Plugin

Pilihan Menu	Shortcut	Referensi	Toolbar
Kelola dan Pasang Plugin		lihat *Mengelola Plugin*	
Konsol Python			
GRASS →		lihat *GRASS GIS Integration*	*GRASS*

Saat memulai QGIS untuk pertama kali tidak semua inti plugin dimuat.

7.1.8 Vektor

Pilihan Menu	Shortcut	Referensi	Toolbar
Rekaman Koordinat →		lihat *Plugin Mengambil Koordinat*	*Vektor*
Dxf2Shp →		lihat *Plugin Pengonversi Dxf2Shp*	*Vektor*
GPS →		lihat *GPS Plugin*	*Vektor*
Open Street Map →		lihat *Loading OpenStreetMap Vectors*	
Grafik Road →		lihat *Plugin Grafik Jalan*	
Query Spasial →		lihat *Plugin Spasial Query*	*Vektor*

Saat memulai QGIS untuk pertama kali tidak semua inti plugin dimuat.

7.1.9 Raster

Pilihan Menu	Shortcut	Referensi	Toolbar
Kalkulator Raster		lihat *Raster Calculator*	
Georeferencer →		lihat *Plugin Georeferencer*	*Raster*
Heatmap →		lihat *Heatmap Plugin*	*Raster*
Interpolasi →		lihat *Plugin Interpolasi*	*Raster*
Statistik Zonal →		lihat *Plugin Statistik Zonal*	*Raster*

Saat memulai QGIS untuk pertama kali tidak semua inti plugin dimuat.

7.1.10 Basis data

Pilihan Menu	Shortcut	Referensi	Toolbar
eVis →		lihat *eVis Plugin*	*Basis data*
Spit →		lihat *label_spit*	*Basis data*

Saat memulai QGIS untuk pertama kali tidak semua inti plugin dimuat.

7.1.11 Pengolahan

Pilihan Menu	Shortcut	Referensi	Toolbar
Toolbox		lihat *The toolbox*	*Toolbox*
Grafis Modeler		lihat *The graphical modeler*	
Sejarah dan Log		lihat *The history manager*	
Opsi dan Konfigurasi		lihat *Configuring the processing framework*	
Penampil hasil		lihat *Configuring external applications*	
Perintah	`Ctrl+Alt+M`	lihat *The SEXTANTE Commander*	

Saat memulai QGIS untuk pertama kali tidak semua inti plugin dimuat.

7.1.12 Bantuan

Pilihan Menu	Shortcut	Referensi	Toolbar
Konten Bantuan	`F1`		*Bantuan*
Apakah ini?	`Shift+F1`		*Bantuan*
Dokumentasi API			
Butuh dukungan ?			
|qg| *Beranda*	`Ctrl+H`		
Periksa versi |qg|			
Tentang			
Sponsor |qg|			

Harap dicatat bahwa untuk Linux item Menu Bar yang tercantum di atas adalah yang standar di window manager KDE. Di GNOME, menu Pengaturan memiliki isi yang berbeda dan item bisa ditemukan di sini:

Properti Proyek	*Proyek*
Opsi	*Edit*
Konfigurasi Shortcuts	*Edit*
Pengelola Gaya	*Edit*
Modifikasi CRS	*Edit*
Panel →	*Tampilan*
Toolbar →	*Tampilan*
Toggle Mode Layar Penuh	*Tampilan*
Slider Skala Tile	*Tampilan*
Pelacakan GPS	*Tampilan*

7.2 Toolbar

Toolbar menyediakan akses ke sebagian besar fungsi yang sama seperti menu, ditambah alat tambahan untuk berinteraksi dengan peta. Setiap item toolbar memiliki popup bantuan yang tersedia. Tahan tetikus anda ke atas item dan deskripsi singkat mengenai tujuan alat itu akan ditampilkan.

Setiap menubar dipindah kesekitarnya sesuai dengan kebutuhan Anda. Selain itu setiap menubar dapat dimatikan menggunakan tombol kanan tetikus pada menu konteks Anda, arahkan tetikus ke toolbar (baca juga *Panel dan Toolbar*)

Tip: Mengembalikan toolbar

Jika Anda tidak sengaja telah menyembunyikan semua toolbar Anda, Anda dapat mengembalikannya dengan memilih menu opsi *Pengaturan* → *Toolbar* →. Jika toolbar menghilang di bawah OS Windows, tampaknya menjadi masalah di QGIS dari waktu ke waktu, Anda harus menghapus `\HKEY_CURRENT_USER\Software\QGIS\qgis\UI\state` di registry. Ketika Anda hidupkan ulang QGIS, kuncinya ditulis lagi secara standar, dan semua toolbar terlihat kembali.

7.3 Legenda Peta

Area legenda peta merupakan daftar semua lapisan (layer) dalam proyek.

Suatu lapisan (layer) dapat dipilih dan digeser ke atas atau kebawah pada legenda menjadi Z-ordering. Z-ordering berarti bahwa lapisan yang terdaftar di bagian atas legenda digambar lapisan bawahnya tercantum dalam legenda.

Catatan: Perilaku ini dapat diganti dengan panel 'urutan lapisan'.

Lapisan di jendela legenda dapat dikelompokkan dalam grup. Ada dua cara untuk melakukannya:

1. Klik kanan di jendela legenda dan pilih *Tambah Grup*. Beri nama untuk grup tersebut dan tekan `Enter`. Sekarang klik pada lapisan (layer) yang ada dan geser ke dalam grup.
2. Pilih beberapa lapisan (layer), klik kanan pada jendela legenda dan pilih *Grup Terpilih*. Lapisan-lapisan yang dipilih secara otomatis akan menjadi satu grup baru.

Untuk mengeluarkan lapisan dari grup, Anda bisa menggesernya keluar, atau klik kanan dan pilih *Ubah jadi tingkat teratas*. Grup dapat masuk kedalam grup lain.

Kotak centang grup akan memunculkan atau menyembunyikan lapisan dalam grup dengan satu klik.

Isi dari konteks menu tombol kanan tetikus tergantung pada item legenda yang dipilih lapisan (layer) raster atau vektor. Untuk lapisan vektor GRASS ✏ Toggle mengedit tidak tersedia. Lihat bagian *Digitizing and editing a GRASS vector layer* untuk informasi menyunting lapisan (layer) vektor GRASS.

Tombol kanan tetikus untuk lapisan raster

- *Perbesar lapisan extent*
- *Perbesar Skala Terbaik (100%)*
- *Peregangan Menggunakan Luas Terkini*
- Tampilkan di overview
- *Buang*
- *Duplikat*
- *Atur CRS Lapisan*
- *Atur CRS Proyek dari Lapisan*
- *Simpan sebagai ...*
- *Properti*
- *Ubah Nama*
- *Gaya Salin*
- *Tambah Grup Baru*
- *Perlihatkan semua*
- *Tutup semua*
- *Pembaruan Pesanan Drawing*

Selain itu, menurut posisi dan seleksi lapisan (layer)

- *Ubah jadi item tingkat teratas*
- *Grup dipilih*

Tombol kanan tetikus menu untuk lapisan vektor

- *Perbesar ke Lapisan Extent*
- *Tampilkan di Overview*
- *Buang*
- *Duplikat*
- *Atur CRS Lapisan*
- *Atur CRS Proyek dari Lapisan*
- *Buka Tabel Atribut*

- *Toggle Mengedit* (tidak tersedia untuk Lapisan GRASS)
- *Simpan Sebagai ...*
- *Simpan Yang Diseleksi Sebagai*
- *Saring*
- *Tampilkan Fitur Hitung*
- *Properti*
- *Ubah Nama*
- *Gaya Salin*
- *Tambah Grup Baru*
- *Perlihatkan semua*
- *Tutup semua*
- *Pembaruan Pesanan Drawing*

Selain itu, menurut posisi dan seleksi lapisan (layer)

- *Ubah jadi item tingkat teratas*
- *Grup dipilih*

Tombol kanan tetikus menu untuk grup lapisan

- *Perbesar ke Grup*
- *Buang*
- *Atur Grup CRS*
- *Ubah Nama*
- *Tambah Grup Baru*
- *Perlihatkan semua*
- *Tutup semua*
- *Pembaruan Pesanan Drawing*

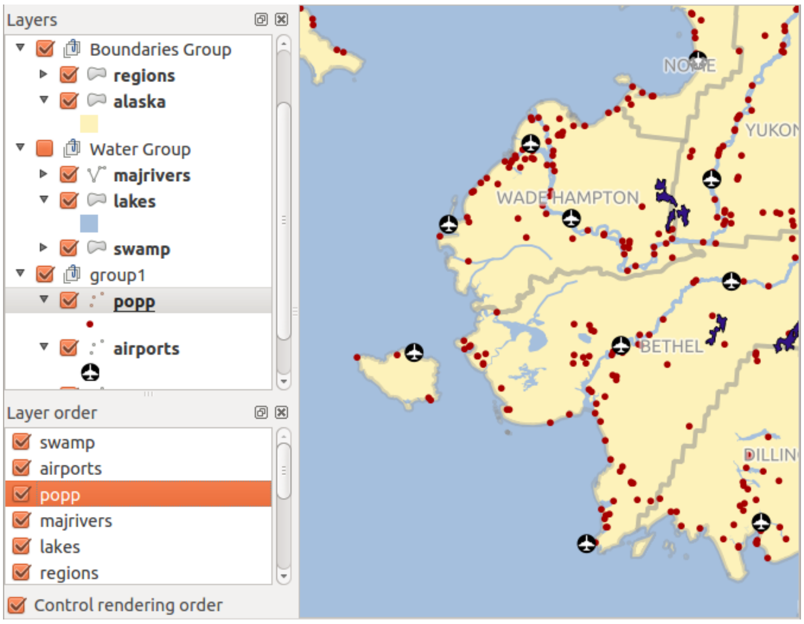
Saat ini memungkinkan memilih lebih dari satu lapisan atau grup pada waktu yang sama dengan menekan tombol `Ctrl` sambil memilih lapisan dengan tombol kiri tetikus. Kemudian Anda dapat memindah semua lapisan terpilih ke dalam grup baru pada waktu yang sama.

Anda juga dapat menghapus lebih dari satu Lapisan atau Grup sekaligus dengan memilih beberapa Lapisan (layer) dengan menekan tombol `Ctrl` dan setelah itu `Ctrl+D`. Dengan cara ini semua Lapisan atau Grup terpilih akan dibuang dari daftar lapisan.

7.3.1 Bekerja dengan Legenda urutan lapisan tersendiri

Terdapat widget yang memungkinkan untuk mendefinisikan urutan legenda gambar independen. Anda dapat mengaktifkannya dari menu *Pengaturan* → *Panel* → *Urutan Lapisan*. Di sini menentukan urutan gambar dari lapisan dalam tampilan peta. Melakukan hal ini memungkinkan untuk mengurutkan lapisan Anda dalam urutan kepentingan, sebagai contoh, tapi masih menampilkan mereka dalam urutan yang benar (lihat figure_layer_order).

Mengaktifkan kotak ☑ *Kontrol urutan rendering* bawah daftar lapisan akan menyebabkan kembali ke suatu perilaku standar.



Gambar 7.2: Mendefiniskan legenda urutan lapisan tersendiri 🐧

7.4 Tampilan Peta

Ini "business end" dari QGIS - peta tampil di area ini! Peta yang ditampilkan dalam jendela ini tergantung pada lapisan vektor dan raster yang telah Anda pilih (lihat bagian informasi lebih lanjut tentang cara untuk memuat lapisan). Tampilan peta dapat digeser (mengalihkan fokus tampilan peta untuk daerah lain) dan memperbesar atau memperkecilnya. Berbagai operasi lainnya dapat dilakukan pada peta seperti yang dijelaskan dalam deskripsi toolbar di atas. Tampilan peta dan legenda terikat erat satu sama lain - peta dalam tampilan mencerminkan perubahan yang Anda buat di daerah legenda.

Tip: Perbesar peta dengan tetikus

Anda dapat menggunakan tetikus untuk memperbesar dan memperkecil peta. Tempatkan kursor tetikus di dalam area peta dan roll roda depan (jauh dari Anda) untuk memperbesar dan belakang (ke arah Anda) untuk memperkecil. Posisi kursor tetikus adalah pusat di mana perubahan terjadi. Anda dapat menyesuaikan perilaku pembesaran roda tetikus menggunakan menu *Alat Peta* dalam menu *Pengaturan* → *Opsi*.

Tip: Menggeser peta dengan tombol panah dan spasi bar

Anda dapat menggunakan tombol panah untuk menggeser peta. empatkan kursor tetikus dalam area peta dan klik panah kanan untuk menggeser ke Timur, panah kiri untuk menggeser ke Barat, panah atas untuk menggeser ke Utara dan pana bawah untuk menggeser ke Selatan. Anda juga dapat menggeser peta dengan menggunakan bar spasi atau klik pada tetikus: hanya menggerakkan tetikus bersamaan menekan bar spasi atau klik tetikus.

7.5 Status Bar

Bar status melihatkan posisi kursor Anda dalam koordinat peta (misal meter atau derajat desimal) sesuai dengan titik kursor tetikus bergerak pada tampilan peta. Di sebelah kiri tampilan koordinat di bar status adalah tombol kecil yang akan beralih antara menampilkan posisi koordinat atau menampilkan luasan peta saat Anda menggeser dan memperbesar/memperkecil tampilan peta.

Sebelah tampilan koordinat Anda menemukan tampilan skala. Itu menunjukkan skala dari tampilan peta. Jika Anda memperbesar atau memperkecil QGIS berisi skala saat ini. Ada pemilih skala yang memungkinkan Anda untuk memilih skala standar dari 1:500 sampai 1:1000000.

Suatu perkembangan (progres) bar di status bar menunjukkan kemajuan (progres) render karena setiap lapisan yang diubah di tampilan peta. Dalam beberapa kasus, seperti pengumpulan statistik di lapisan raster, progress bar akan menunjukkan status panjangnya operasi.

Jika ada plugin baru atau pembaruan plugin tersedia, Anda akan melihat pesan sebelah kiri dari bar status. Di sisi kanan status bar adalah kotak centang kecil yang dapat digunakan untuk lapisan sementara yang diberikan ke tampilan peta (lihat Bagian *Rendering*). Ikon menghentikan proses rendering peta sekarang.

Sebelah kanan dari fungsi render, Anda akan menemukan kode EPSG dari CRS proyek sekarang dan ikon proyektor. Mengklik ini akan membuka properti proyeksi untuk proyek saat ini.

Tip: Menghitung skala koreksi dari kanvas peta Anda

Saat Anda memulai QGIS, derajat merupakan unit standar, dan QGIS memberitahu bahwa setiap koordinat pada lapisan Anda dalam derajat. Untuk mengubah nilai skala, Anda juga dapat mengubahnya ke satuan meter secara manual di tab *Umum* dalam *Pengaturan → Proyek Properti* atau Anda bisa memilih Coordinate Reference System (CRS) proyek dengan klik ikon CRS status di bagian kanan bawah dari status bar. Dalam kasus terakhir, unit ditetapkan untuk menentukan proyeksi proyek, misalnya '+unit=m'.

BAB 8

Peralatan Umum

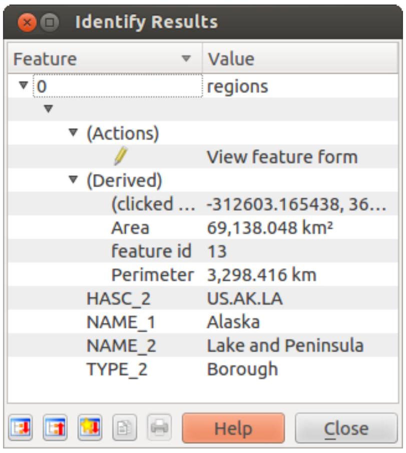
8.1 Fitur Identifikasi

Fitur identifikasi memungkinkan berinteraksi dengan kanvas peta untuk mendapatkan atribut data pada sebuah jendela pop-up. Fitus identifikasi menggunakan *Tampilan* → *Identifikasi Fitur* atau Ctrl+Shift+I, atau klik ikon pada Identifikasi Fitur toolbar.

Jika Anda klik beberapa fitur, poop-up ini akan mendaftar semua data atribut dari semua fitur. Item pertama adalah jumlah item dalam daftar hasil diikuti dengan nama lapisan. Maka anak pertama akan menjadi nama sebuah kolom dengan nilainya. Akhirnya semua informasi dari fitur tersebut akan ditampilkan.

Jendela ini dapat disesuaikan untuk menampilkan kolom kustom namun secara default akan menampilkan tiga jenis informasi:

- Aksi-aksi: Aksi-aksi ditambahkan untuk mengidentifikasi fitur windows. Ketika mengklik pada aksi label, aksi akan berjalan. Secara default hanya satu tindakan ditambahkan untuk meihat form fitur untuk mengedit.
- Derived: informasi mereka dihitung atau berasal dari informasi lainnya. Anda bisa menemukan koordinat diklik, koordinat X dan Y, area di unit dan parameter peta dalam unit peta untuk poligon, panjang unit peta untuk garis dan id fitur.
- Data atribut: Daftar kolom atribut dari data



Feature	Value
▾ 0	regions
▾	
▾ (Actions)	
	View feature form
▾ (Derived)	
(clicked …	-312603.165438, 36…
Area	69,138.048 km²
feature id	13
Perimeter	3,298.416 km
HASC_2	US.AK.LA
NAME_1	Alaska
NAME_2	Lake and Peninsula
TYPE_2	Borough

Gambar 8.1: Dialog identifikasi fitur (Gnome)

Di bagian bawah dari jendela, Anda memiliki lima ikon:

- Expand tree
- Collapse tree

- Default behaviour
- Salin atribut
- Print selected HTML response

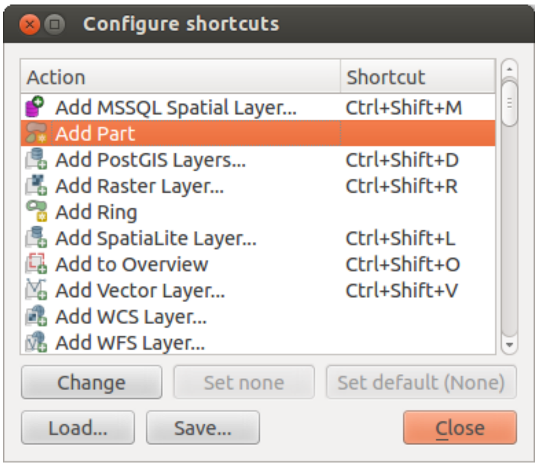
Fitur selebihnya dapat ditemukan dalam tampilan menu dengan klik kanan tetikus pada suatu tempat dengan respon pohon.

Menu ini memungkinkan untuk:

- Lihat form fitur
- Perbesar ke fitur
- Salin fitur: salin semua fitur geometri dan atribut;
- Salin nilai atribut: hanya menyalin nilai dari atribut Anda klik;
- Salin atribut fitur: hanya menyalin atribut
- Bersihkan hasil: hasil di jendela telah dihapus
- Bersihkan highlight: fitur highlight pada peta telah dihapus
- Highlight semua
- Highlight lapisan
- Properti lapisa: buka jendel properti lapisan
- Perluas (expand) semua
- Runtuh (collapse) semua

8.2 Shortcut Papanketik

QGIS menyediakan standar shortcut papan ketik untuk banyak fitur. Anda menemukannya di Bagian *Bar Menu*. Selain itu di menu opsi *Pengaturan* → *Konfigurasi Shortcut* memungkinkan merubah standar shortcut papanketik dan menambah shortcut papanketik baru ke fitur QGIS.



Action	Shortcut
Add MSSQL Spatial Layer...	Ctrl+Shift+M
Add Part	
Add PostGIS Layers...	Ctrl+Shift+D
Add Raster Layer...	Ctrl+Shift+R
Add Ring	
Add SpatiaLite Layer...	Ctrl+Shift+L
Add to Overview	Ctrl+Shift+O
Add Vector Layer...	Ctrl+Shift+V
Add WCS Layer...	
Add WFS Layer...	

Gambar 8.2: Tentukan pilihan shortcut (Gnome)

Konfigurasi sederhana. Hanya pilih fitur dari daftar dan klik pada **[Ubah]**, **[Atur none]** atau **[Atur Standar]**. Setelah Anda telah menemukan konfigurasi, Anda dapat menyimpannya sebagai berkas XML dan muat pada instalasi QGIS lain.

8.3 Konteks Bantuan

Saat Anda membutuhkan bantuan dengan topik yang spesifik, Anda dapat mengakses konteks bantuan melalui tombol *Bantuan* tersedia disebagian besar dialog - harap dicatat bahwa plugin pihak ketiga dapat mengarah ke halaman web khusus.

8.4 Rendering

Secara standar, QGIS membuat semua lapisan terlihat setiap kali kanvas peta di-refresh. Peristiwa yang memicu refresh kanvas peta meliputi:

- Menambahkan lapisan (layer)
- Menggeser atau memperbesar
- Mengukur jendela QGIS
- Merubah visitabilitas dari lapisan (layer)

QGIS memungkinkan Anda mengontrol proses rendering dalam beberapa cara.

8.4.1 Scale Dependent Rendering

Skala render memungkinkan Anda untuk menentukan skaa minimum dan skala maksimum di mana lapisan akan terlihat. Untuk mengatur skala render bergantung, buka dialog *Properti* dengan mengklik-dobel pada lapisan di legenda. Pada tab *Umum* klik pada kotak centang ☑*Gunakan skala dependent rendering* untuk mengaktifkan fitur yang mengatur nilai maskimum dan minimum skala.

Anda dapat menentukan nilai skala dengan terlebih dahulu perbesar ke tingkat yang ingin Anda gunakan dan mencatat nilai skala pada status bar QGIS.

8.4.2 Mengontrol Rendering Peta

Rendering peta dapat dikontrol dengan mengikuti petunjuk:

Menunda Rendering

Untuk menunda rendering, klik kotak centang ☑ *Render* di sudut bawah kanan dari status bar. Ketika kotak centang ☑ *Render* tidak diaktifkan, QGIS tidak menggambar ulang kanvas dalam menanggapi setiap kejadian yang telah diuraikan dalam Bagian *Rendering*. Contoh ketika Anda mungkin ingin menunda render meliputi:

- Tambahkan beberapa lapisan dan simbol sebelum menggambar
- Tambahkan satu atau lebih lapisan dan atur skala ketergantungan sebelum menggambar
- Tambahkan satu atau lebih lapisan dan perbesar ke tampilan yang spesifik sebelum menggambar
- Kombinasi dari yang ada di atas

Aktifkan kotak centang ☑ *Render* mengaktifkan rendering dan dan menyebabkan refresh langsung dari kanvas peta.

Pengaturan Lapisan Tambah Opsi

Anda dapat mengatur pilihan untuk selalu memuat lapisan baru tanpa menggambar mereka. Ini berarti lapisan akan ditambahkan ke peta, namun visibilitas kotak centang dalam legenda akan dicentang secara default. Untuk mengatur opsi ini, pilih menu opsi *Pengaturan* → *Opsi* → dan klik pada menu *Rendering*. Hapus tanda centang ☑ *Secara standar lapisan baru ditambahkan ke peta selalu ditampilkan*. Setiap lapisan ditambahkan ke peta akan tidak terlihat secara standar.

Opsi lain di menu *Pengaturan* → *Opsi* → *Rendering* kotak centang ☑ *Aktifkan buffer*. Ini memberikan kinerja grafis yang lebih baik pada kemungkinan kehilangan biaya untuk membatalkan rendering dan menggambar fitur tambahan. Jika tidak dicentang, Anda dapat mengatur 'Jumlah fitur untuk menarik sebelum memperbarui tampilan', selain itu tidak aktif.

Akhirnya Anda bisa mengaktifkan kotak centang ☑ *Gunakan render caching mungkin untuk mempercepat gambar ulang*.

Menghentikan Rendering

Untuk menghentikan penggambaran peta, tekan tombol `ESC`. Ini akan menghentikan refresh kanvas peta dan menghentikan proses penggambaran peta. Hal ini mungkin membutuhkan waktu selama menekan `ESC` dan penggambaran peta terhenti.

Catatan: Saat ini tidak memungkikan untuk menghentikan rendering - ini dinonaktifkan di port qt4 karena masalah antarmuka pengguna (UI) dan konflik (crash).

Memperbarui tampilan peta sebelum rendering

Anda dapat mengatur pilihan untuk memperbarui tampilan peta sebagai fitur. Secara standar, QGIS tidak menampilkan semua fitur untuk lapisan sampai seluruh lapisan telah dirender.Untuk memperbarui tampilan seperti fitur dibaca dari datastore, pilih opsi menu *Pengaturan* → *Opsi* klik pada menu *Rendering*. Mengatur jumlah fitur untuk nilai yang sesuai untuk memperbarui tampilan selama rendering. Menetapkan nilai 0 menonaktifkan pembaruan selama menggambar (ini adalah default). Menetapkan nilai terlalu rendah akan menghasilkan kinerja yang buruk pada kanvas peta terus diperbarui selama pembacaan fitur. Nilai yang disarankan untuk memulai adalah 500.

Mempengarui Kualitas Rendering

Untuk mempengaruhi kualitas dari peta Anda memiliki 2 opsi. Pilih opsi menu *Pengaturan* → *Opsi* klik pada menu *Rendering* dan pilih atau tidak kotak centang berikut.

- ☑ *Membuat garis tampil kurang baik dengan mengorbankan beberapa kinerja menggambar*
- ☑ *Memperbaiki masalah isi poligon*

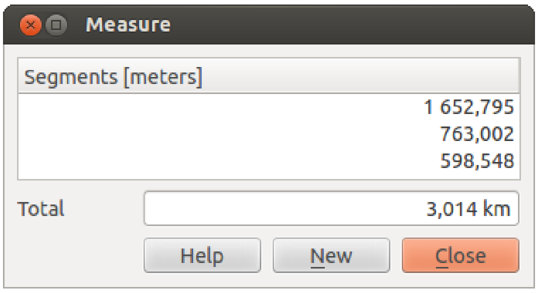
8.5 Mengukur

Mengukur peta dalam proyeksi sistem koordinat (misal UTM) dan data belum terproyeksi. Jika peta dimuat didefinisikan dengan sistem koordinat geografis (lintang/bujur), hasil dari garis atau daerah pengukuran akan salah. Untuk memperbaiki ini, Anda perlu mengatur peta sesuai sistem koordinat (lihat Bagian *Working with Projections*). Semua modul pengukuran juga menggunakan pengaturan snapping dari modul digitalisasi. Hal ini berguna, jika Anda ingin mengukur garis atau area di lapisan vektor.

Untuk memilih alat ukur, klik di 📏 dan pilih alat yang ingin digunakan.

8.5.1 Mengukur panjang, area dan sudut

Mengukur Garis: QGIS mampu mengukur jarak nyata antar poin yang diberikan sesuai dengan ellipsoid yang didefinisikan. Untuk mengonfigurasinya, pilih menu opsi *Pengaturan* → *Opsi*, klik tab *Peralatan Peta* dan pilih ellipsoid yang tepat. Di sana Anda juga dapat mendefinisikan warna karet gelang (rubberband) dan satuan pengukuran pilihan Anda (meter atau feet) dan satuan sudut (derajat, radian dan gon). Kemudian memungkinkan Anda untuk mengklik titik pada peta. Setiap panjang-segmen serta total muncul dalam jendela-ukuran. Untuk menghentikan pengukuran klik tombol tetikus sebelah kanan.

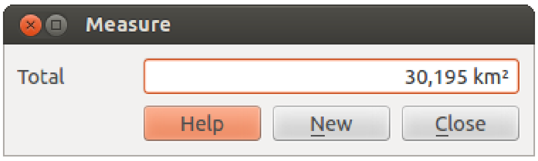


Segments [meters]
1 652,795
763,002
598,548

Total 3,014 km

Gambar 8.3: Mengukur Panjang (Gnome)

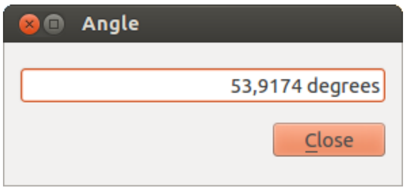
Mengukur Area: Area juga dapat diukur. Pada jendela mengukur muncul ukuran daerah akumulasi. Selain itu, alat ukur akan mengambil (snap) ke lapisan yang sedang dipilih, asalkan lapisan yang memiliki toleransi yang ditetapkan. (Lihat Bagian *Setting the Snapping Tolerance and Search Radius*). Jadi jika Anda ingin mengukur persis sepanjang fitur garis, atau sekitar fitur poligon, pertama kali atur toleransi snap, kemudian pilih lapisan. Sekarang, ketika menggunakan alat ukur, setiap klik tetikus (dalam pengaturan toleransi) akan merekam (snap) ke lapisan itu.



Total 30,195 km²

Gambar 8.4: Mengukur Area (Gnome)

Mengukur Sudut: Anda juga bisa mengukur sudut. Kursor menjadi cross-shaped. Klik untuk menggambar segmen pertama dari sudut yang ingin diukur, kemudian memindahkan kursor untuk menggambar sudut yang diinginkan. Alat ukur akan ditampilkan dalam dialog pop-up.



53,9174 degrees

Gambar 8.5: Mengukur Sudut (Gnome)

8.5.2 Pilih dan lepas fitur

Toolbar QGIS menyediakan beberapa alat untuk memilih fitur dalam kanvas peta. Untuk memilih satu atau beberapa fitur klik pada dan pilih perangkat Anda:

- Pilih Fitur Tunggal
- Pilih Fitur dari Rectangle
- Pilih Fitur dari Poligon
- Pilih Fitur dari Freehand
- Pilih Fitur dari Radius

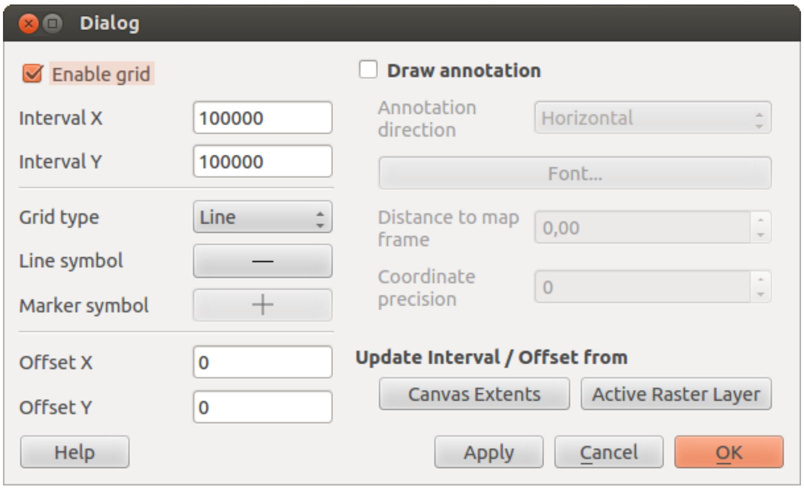
Untuk melepas semua fitur yang dipilih klik di Lepas fitur dari semua lapisan.

8.6 Dekorasi

Dekorasi dari QGIS termask Grid, Label Hak Cipta, Panah Utara, dan Bar Skala. Mereka digunakan untuk 'dekorasi' peta dengan menambahkan elemen peta.

8.6.1 Kisi (Grid)

Grid memungkinkan untuk menambahkan koordinat kisi (grid) dan koordinat anotasi untuk kanvas peta.



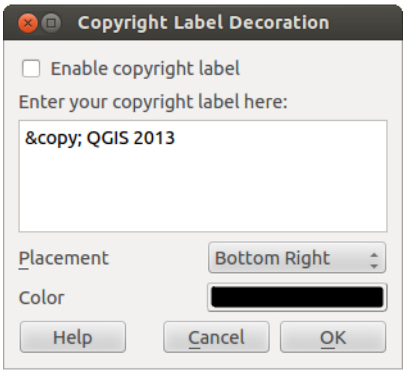
☑ Enable grid
Interval X: 100000
Interval Y: 100000
Grid type: Line
Offset X: 0
Offset Y: 0
☐ Draw annotation
Annotation direction: Horizontal
Distance to map frame: 0,00
Coordinate precision: 0

Gambar 8.6: Dialog Kisi (Grid)

1. Pilih dari menu *Tampilan* → *Decorasi* → *Kisi*. Mulai dialog (lihat figure_decorations_1).
2. Aktifkan kotak centang ☑ *Aktifkan Kisi* dan menetapkan definisi kisi (grid) sesuai dengan lapisan yang dimuat dalam kanvas peta.
3. Aktifkan kotak centang *Gambar anotasi* dan menetapkan definisi anotasi sesuai dengan lapisan yang dimuat dalam kanvas peta.
4. Klik **[Terapkan]** untuk memeriksa, jika terlihat seperti yang diharapkan.
5. Klik **[OK]** untuk menutup dialog.

8.6.2 Label Hak Cipta

Label Hak Cipta menambahkan label hak cipta menggunakan teks untuk peta.


Copyright Label Decoration
☐ Enable copyright label
Enter your copyright label here:
&copy; QGIS 2013
Placement
Bottom Right
Color
Help
Cancel
OK

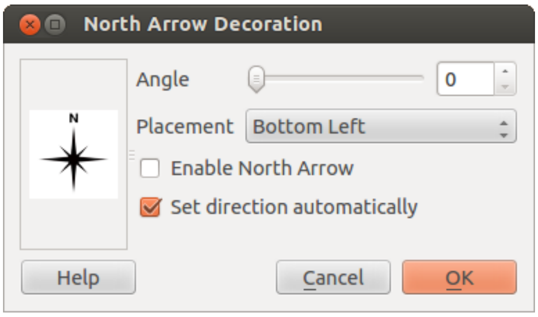
Gambar 8.7: Dialog Hak Cipta

1. Pilih dari menu *Tampilan* → *Dekorasi* → *Label hak Cipta*. (lihat figure_decorations_2).
2. Masukkan teks yang Anda ingin tempatkan di peta. Anda bisa menggunakan HTML seperti dalam contoh
3. Pilih penempatan label dari *Penempatan* 'Kanan Bawah' kotak drop-down
4. Pastikan kotak centang telah ditandai/aktifkan *Aktifkan Label Hak Cipta*
5. Klik **[OK]**

Dalam contoh di atas (default) QGIS menempatkan simbol hak cipta diikuti dengan tanggal di bagian bawah sudut kanan dari kanvas peta.

8.6.3 Panah Utara

Panah Utara menempatkan panah utara sederhana di kanvas peta. Saat ini hanya ada satu gaya yang tersedia. Anda dapat mengatur sudut panah atau membiarkan QGIS mengatur arah secara otomatis. Jika Anda memilih untuk membiarkan QGIS menentukan arah, itu membuat QGIS menebak yang terbaik bagaimana panah harus berorientasi. Untuk penempatan panah, Anda memiliki empat pilihan, sesuai dengan empat penjuru kanvas peta.

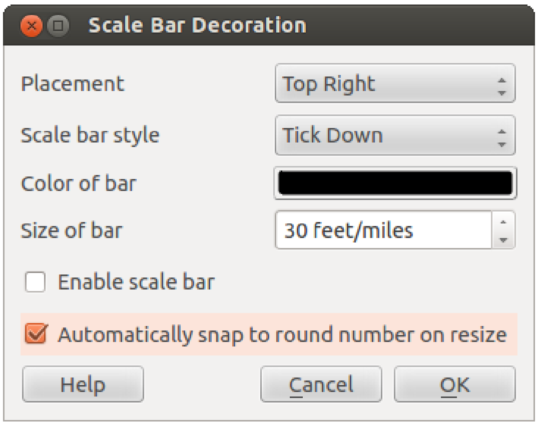

North Arrow Decoration
N
Angle
0
Placement
Bottom Left
☐ Enable North Arrow
☑ Set direction automatically
Help
Cancel
OK

Gambar 8.8: Dialog Panah Utara

8.6.4 Bar Skala

Skala Bar menambahkan bar skala sederhana untuk kanvas peta. Anda mengontrol gaya dan penempatan, serta pelabelan bar.

QGIS hanya mendukung menampilkan skala dalam satuan yang sama dengan kerangka peta Anda. Jadi jika satuan lapisan Anda dalam meter, Anda tidak dapat membuat skala bar dalam kaki (feet). Demikian juga jika Anda menggunakan derajat desimal, Anda tidak dapat membuat skala bar untuk menampilkan jarak dalam meter.



Placement: Top Right

Scale bar style: Tick Down

Color of bar

Size of bar: 30 feet/miles

☐ Enable scale bar

☑ Automatically snap to round number on resize

Gambar 8.9: Dialog Bar Skala

Menambahkan bar skala:

1. Pilih dari menu *Tampilan* → *Dekorasi* → *Skala Bar* (lihat figure_decorations_4)
2. Pilih penempatan dari daftar drop-down *Penempatan* 'Kiri Bawah'
3. Pilih gaya dari daftar *Gaya bar Skala* 'Tick Down'
4. Pilih warna bar *warna bar* 'black' atau gunakan hitam warna default
5. Atur ukuran bar dan labelnya *Ukuran bar* '30 degrees'
6. Pastikan kotak centang sudah aktif ☑ *Aktifkan skala bar*
7. Opsional memilih secara otomatis snap ke angka bulat ketika kanvas diubah ukurannya ☑ *Automatically snap to round number on resize*
8. Klik **[OK]**

Tip: Pengaturan Dekorasi

Saat Anda menyimpan sebuah proyek .qgs, setiap perubahan yang Anda buat pada Kisi (Grid), Panah Utara, Skala Bar dan Hak Cipta akan disimpan dalam proyek dan dikembalikan pada saat Anda memuat proyek.

8.7 Peralatan Anotasi

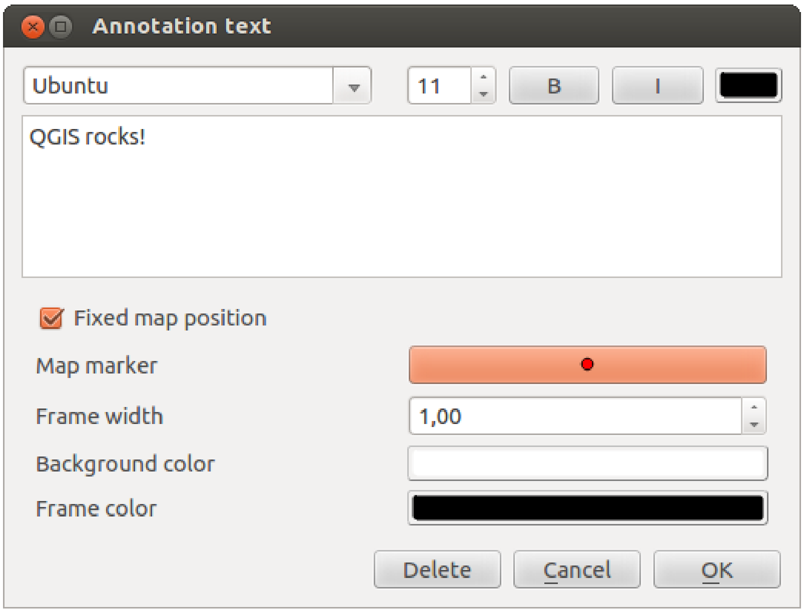
Peralatan Anotasi Teks dalam toolbar atribut memberikan kemungkinan untuk menempatkan teks diformat dalam balon pada kanvas Peta QGIS. Gunakan alat *Anotasi Teks* dan klik kedalam kanvas peta.

Dobel klik pada item membuka dialog dengan berbagai pilihan. Ada editor teks untuk memasukkan teks yang diformat dan pengaturan item lain. Misalnya ada pilihan memiliki item ditempatkan pada posisi peta (ditampilkan dengan simbol penanda) atau memiliki item pada posisi layar (tidak berhubungan dengan peta). Item ini bisa dipindahkan dengan posisi peta (geser penanda peta) atau hanya dengan memindahkan balon. Ikon adalah bagian dari tema GIS, dan digunakan secara default dalam tema-tema lain juga.

Alat Pindah Anotasi memungkinkan memindah anotas pada kanvas peta.

8.7.1 Anotasi HTML

Alat Anotasi Html dalam toolbar atribut memberikan kemungkinan untuk menempatkan isi berkas HTML dalam balon pada kanvas Peta QGIS. Gunakan alat *Anotasi Html* dan klik kedalam kanvas peta dan menambahkan path



QGIS rocks!

☑ Fixed map position

Map marker ●

Frame width 1,00

Background color

Frame color

Gambar 8.10: Dialog teks anotasi

ke berkas html ke dalam dialog.

8.7.2 Anotasi SVG

Alat Anotasi SVG dalam toolbar atribut memberikan kemungkinan untuk menempatkan simbol SVG dalam balon pada kanvas Peta QGIS. Gunakan alat *Anotasi SVG* dan klik kedalam kanvas peta dan menambahkan path ke berkas SVG ke dalam dialog.

8.7.3 Form anotasi

Selain itu Anda juga dapat membuat form anotasi Anda sendiri. Alat Form Anotasi ini berguna untuk menampilkan atribut dari lapisan vektor dalam form desainer qt disesuaikan (lihat figure_custom_annotation). Hal ini mirip dengan form desainer alat *Identifikasi fitur*, tetapi ditampilkan dalam item anotasi. Lihat juga blog QGIS http://blog.qgis.org/node/143 untuk informasi lebih lanjut.

Catatan: Jika Anda menekan `Ctrl+T` sementara alat *Anotasi* aktif (anotasi bergerak, anotasi teks, form anotasi), visibilitas item yang terbalik.

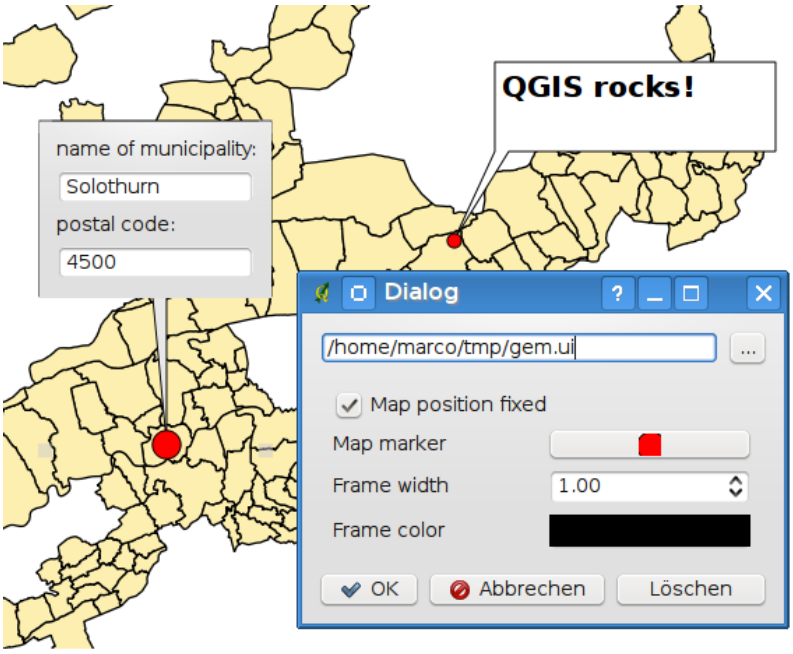
8.8 Bookmark Spasial

Bookmark spasial memungkinkan Anda untuk “bookmark” lokasi geografis dan kembali ke spasial ini suatu saat nanti.

8.8.1 Membuat Bookmark

Membuat Bookmark

1. Perbesar atau geser ke interes area.
2. Pilih menu opsi *Tampilan* → *Bookmark Baru* atau tekan `Ctrl-B`.



name of municipality: Solothurn

postal code: 4500

/home/marco/tmp/gem.ui

☑ Map position fixed

Map marker 🟥

Frame width 1.00

Frame color ■

Gambar 8.11: Disesuaikan form anotasi bentuk desainer qt

3. Masukkan nama deskripsi dari bookmark (batas 255 karakter).
4. Tekan `Enter` untuk menambahkan bookmark atau **[Delete]** untuk menghapus bookmark.

Catatan Anda bisa memiliki bookmark banyak dengan satu nama.

8.8.2 Bekerja dengan Bookmark

Menggunakan atau mengelola bookmark, pilih menu opsi *Tampilan* → *Tampilkan Bookmark*.

8.8.3 Perbesar ke Bookmark

Dari dialog *Geospasial Bookmark*, pilih bookmark yang diinginkan dengan mengkliknya, kemudian klik **[Perbesar]**. Anda juga bisa memperbesar ke bookmark dengan dobel-klik padanya.

8.8.4 Menghapus Bookmark

Menghapus bookmark dari dialog *Geospasial Bookmark*, klik padanya dan kemudian klik **[Hapus]**. Konfirmasi Anda pilih dengan klik **[Ya]** atau batal menghapus dengan klik **[Tidak]**..

8.9 Proyek-proyek Nesting

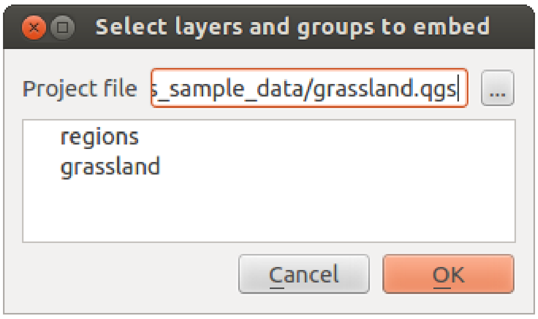
Jika Anda ingin menanamkan (embed) isi dari berkas proyek lain kedalam proyek Anda, Anda bisa memilih *Lapisan* → *Tanam Lapisan dan Grup*.

8.9.1 Menanam (Embedding) lapisan

Mengkuti dialog memungkinkan Anda untuk menanam (embed) lapisan dari proyek-proyek lain:

1. Tekan ... untuk mencari proyek lain dari dataset Alaska.

2. Pilih berkas proyek grassland. Anda bisa melihat konten dari proyek (lihat figure_embed_dialog).
3. Tekan `Ctrl` dan klik pada lapisan grassland dan wilayah. Lapisan akan ditanam dalam legenda peta dan tampilan peta sekarang.


Select layers and groups to embed

Project file: ₅_sample_data/grassland.qgs

regions
grassland

Gambar 8.12: Pilih lapisan-lapisan dan grup-grup untuk ditanam (embed)

Sementara lapisan-lapisan yang ditanam (embedded) adalah bisa diedit Anda tidak bisa merubah properti seperti gaya dan pelabelan.

Menghapus lapisan-lapisan ditanam (embdded)

Klik-kanan pada lapisan yang ditanam (embedded) dan pilih Hapus.

8.10 Menambahkan Lapisan Teks Delimited (Delimited Text Layer)

Fungsi ini memungkinkan Anda memuat berkas teks delimited sebagai lapisan di QGIS. Pengaturan berikut perlu didefinisikan:

1. **Format Berkas** biasanya ● *CSV (comma separated values)*. Jika delimiter lain digunakan, aktifkan tombol ● *custom delimiter'dan jika setiap baris dalam file dibagi menggunakan ekspresi reguler, silakan aktifkan tombol |radiobuttonon| :guilabel:'Regular expression delimiter*.
2. Sebagai berkas teks **Opsi Rekam** biasanya menyediakan baris header dipisahkan kolom nama. Ini biasanya baris pertama dalam berkas teks. Jika tidak ada baris header yang tersedia, nonaktfikan kotak centang ☑ *rekaman pertama adalah kolom nama*. Dan jika baris header bukan baris pertama dari berkas teks, tentukan jumlah baris header untuk dibuang.
3. Sebagai **Opsi Lapangan** Anda dapat memotong spasi kolom leading dan trailing dari mengaktifkan kotak centang ☑ *Trim fields*. Anda bisa ☑ *Discard empty fields* di setiap rekaman dan Anda juga bisa menentukan bahwa ☑ *Sebagai pemisah desimal adalah koma*. Jika tidak, akan menjadi titik.
4. Sebagai **Definisi Geometri** berkas teks khas menyediakan ● *Koordinate Poin*. Ini berarti harus ada kolom 'X' dan 'Y' dengan nilai koordinat. Jika berkas teks menyediakan kolom ● *Well Known Text*, maka harus ada kolom 'WKT' dengan informasi geometri untuk byek poin, garis atau poligon. Kolom ini dapat memiliki nama apapun. Jika tabel atribut mendefinisikan ● *tidak geometri*. Koordinat x dan y harus spesifik sebagai angka. Sistem koordinat tidak penting. Jika didefinisikan dalam derajat/menit/detik, aktfikan kota centang ☑ *Koordinat DMS*.
5. Sebagai **Pengaturan Lapisan** Anda bisa mengaktifkan ☑ *Gunakan Indeks Spasial* untuk meningkatkan kinerja dari menampilkan dan memilih spasial fitur. Anda bisa mendefinsikan ☑ *Gunakan Indeks Subset* dan ☑ *Watch file* untuk melihat perubahan berkas dengan aplikasi lain, sementara QGIS berjalan.

Sebagai contoh sebuah berkas teks yang valid kita mengimpor berkas data elevasi titik `elevp.csv` dengan contoh dataset QGIS (Lihat Bagian *Contoh data*):

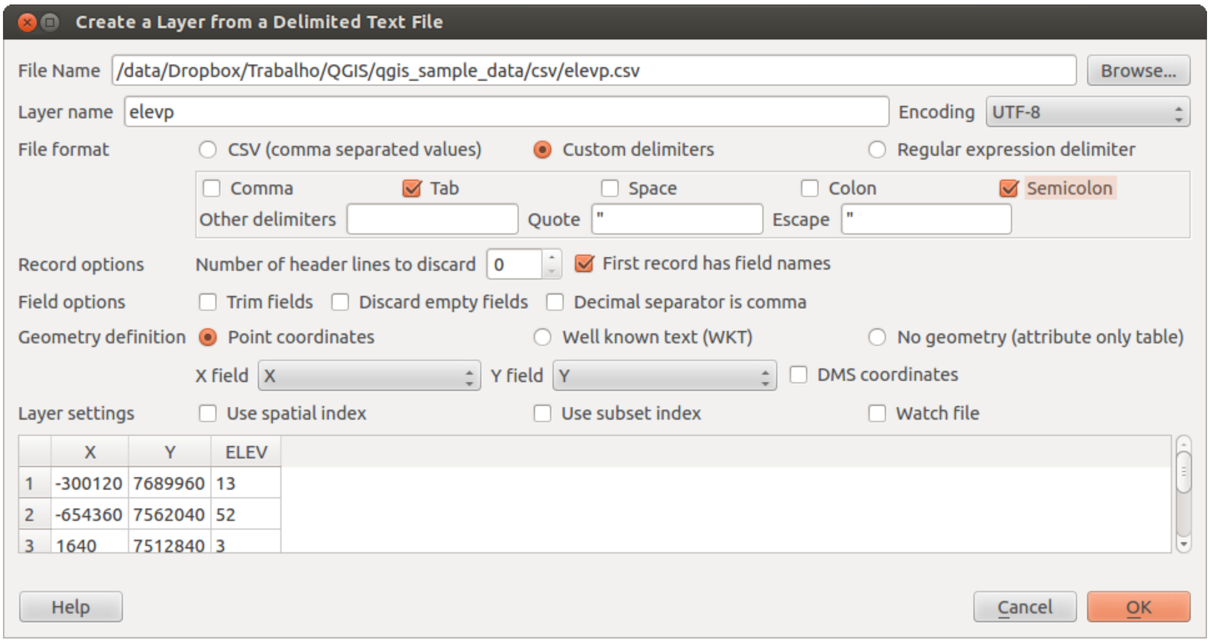
```
X;Y;ELEV
-300120;7689960;13
-654360;7562040;52
1640;7512840;3
[...]
```

Beberapa item dari catatan tentang berkas teks adalah:

1. Contoh berkas teks menggunakan `;` (semicolon) sebagai delimiter. Beberapa karakter bisa digunakan untuk kolom delimit.
2. Baris pertama adalah baris header. Ini berisi `X`, `Y` dan `ELEV`.
3. Tidak ada kutipan (`"`) digunakan untuk bidang teks delimit
4. Koordinat X diisi dalam bidang `X`.
5. Koordinat Y diisi dalam bidang `Y`.

8.10.1 Menggunakan fungsi

Klik ikon toolbar Tambah Lapisan Teks Delimited di toolbar *Kelola Lapisan* membuka dialog *Membuat Lapisan dari Berkas Teks Delimited* seperti yang tampil dalam figure_delimited_text_1.



Create a Layer from a Delimited Text File

File Name: /data/Dropbox/Trabalho/QGIS/qgis_sample_data/csv/elevp.csv

Layer name: elevp

Encoding: UTF-8

File format: ○ CSV (comma separated values) ● Custom delimiters ○ Regular expression delimiter

☐ Comma ☑ Tab ☐ Space ☐ Colon ☑ Semicolon

Other delimiters: Quote: " Escape: "

Record options: Number of header lines to discard: 0 ☑ First record has field names

Field options: ☐ Trim fields ☐ Discard empty fields ☐ Decimal separator is comma

Geometry definition: ● Point coordinates ○ Well known text (WKT) ○ No geometry (attribute only table)

X field: X Y field: Y ☐ DMS coordinates

Layer settings: ☐ Use spatial index ☐ Use subset index ☐ Watch file

	X	Y	ELEV
1	-300120	7689960	13
2	-654360	7562040	52
3	1640	7512840	3

Gambar 8.13: Dialog Teks Delimited

Pertama pilih berkas (seperti `qgis_sample_data/csv/elevp.csv`) untuk impor dengan mengklik pada tombol **[Penjelajah]**. Sekali berkas dipilih, upaya QGIS untuk mem-parsing berkas menggunakan delimiter yang terakhir digunakan, dalam kasus ini titikkoma (`;`). Untuk mem-parsing berkas dengan benar, Ini penting untuk memilih delimiter yang benar. Mengubah delimiter penggunaan tab `\t` (ini adalah ekspresi reguler untuk karakter tab.).

Setelah berkas diuraikan, buat sebuah *Definsi Geometri* ● *Koordinat Poin* dan pilih kolom `X` dan `Y` dari daftar. Akhirnya masukkan nama lapisan (seperti `elevp`) seperti dalam figure_delimited_text_1 . Untuk menambahkan lapisan ke dalam peta, klik **[OK]**. Berkas teks delimited yang sekarang berperilaku seperti halnya lapisan peta lainnya di QGIS.

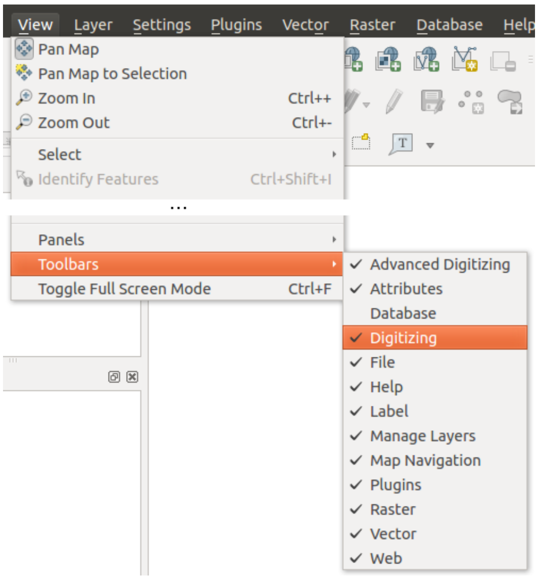
BAB 9

Konfigurasi QGIS

QGIS dapat dikonfigurasi melalui menu *Pengaturan*. Pilih diantara Panel, Toolbar, Properti Proyek, Opsi dan Penyesuaian.

9.1 Panel dan Toolbar

Dalam menu *Panel*→ Anda bisa mengatifkan dan menonaktfikan widget QGIS. Menu *Toolbar*→ memberikan kemungkinan mengaktfikan dan menonatifkan ikon grup di toolbar QGIS (lihat figure_panels_toolbars).


View
Layer
Settings
Plugins
Vector
Raster
Database
Help
Pan Map
Pan Map to Selection
Zoom In Ctrl++
Zoom Out Ctrl+-
Select
Identify Features Ctrl+Shift+I
...
Panels
Toolbars
Toggle Full Screen Mode Ctrl+F
✓ Advanced Digitizing
✓ Attributes
Database
✓ Digitizing
✓ File
✓ Help
✓ Label
✓ Manage Layers
✓ Map Navigation
✓ Plugins
✓ Raster
✓ Vector
✓ Web

Gambar 9.1: Menu Panel dan Toolbar

Tip: Mengaktifkan Tinjauan QGIS

Di QGIS Anda dapat menggunakan panel gambaran yang menyediakan tampilan lapisan tingkat penuh yang ditambahkan ke dalamnya. Hal ini dapat dipilih di bawah menu *Tampilan* → *Panel*. Dalam pandangan persegi panjang yang menunjukkan tingkat peta saat ini. Hal ini memungkinkan Anda dengan cepat menentukan area peta yang sedang Anda lihat. Perhatikan bahwa label tidak diberikan ke gambaran peta bahkan jika lapisan dalam gambaran peta telah diatur untuk pelabelan. Jika Anda klik dan tarik persegi panjang merah dalam gambaran yang menunjukkan gambaran Anda saat ini, tampilan utama peta akan memperbarui.

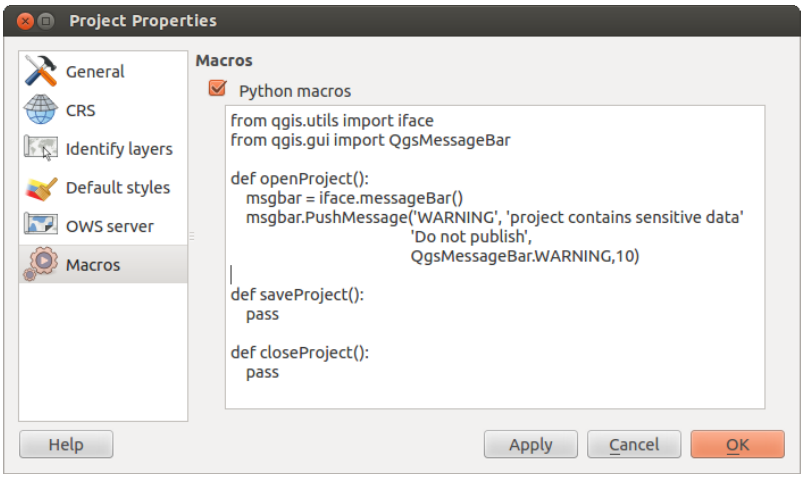
Tip: Tampilkan Pesan Log

Ini memungkinkan untuk melacak pesan QGIS. Anda bisa mengaktifkan ☑ *Log Pesan* dalam menu *Settings* → *Panel* dan ikuti pesan di dalam tab *Umum* dan *Plugin* selama memuat dan operasi.

9.2 Properti Proyek

Di properti jendela dari proyek *Proyek* → *Proyek Properti* atau *Proyek* → *Proyek Properti* Anda mengatur opsi spesifik proyek Mereka termasuk:

- Di dalam menu *Umum* judul proyek, seleksi dan warna latar, satuan lapisan, presisi, dan pilihan untuk menyimpan path relatif terhadap lapisan yang dapat ditentukan. Jika transformasi CRS aktif Anda dapat memilih ellipsoid untuk perhitungan jarak. Anda dapat menentukan satuan kanvas (hanya digunakan ketika transformasi CRS dinonaktifkan) dan ketepatan desimal untuk digunakan. Anda juga dapat menentukan daftar skala proyek, yang menimpa skala yang telah ditentukan global.
- Menu *CRS* memungkinkan Anda untuk memilih Coordinat Reference System untuk proyek ini, dan memungkinkan proyeksi ulang on-the-fly lapisan raster dan lapisan vektor ketika menampilkan lapisan dari CRS yang berbeda.
- Dengan menu ketiga *Identifikasi lapisan* Anda atur (atau nonaktif) lapisan akan merespon alat mengidentifikasi. (Lihat paragraf peralatan Peta dari bagian *Opsi* untuk mengaktifkan identifikasi atau lapisan multi.)
- Menu *Gaya Standar* memungkinkan Anda mengontrol bagaimana lapisan baru akan digambar ketika mereka tidak memiliki gaya .qml yang ditentukan. Anda juga dapat mengatur standar tingkat transparansi untuk lapisan baru dan apakah simbol harus memiliki warna acak kepada mereka.
- Tab *OWS Server* memungkinkan untuk menentukan informasi tentang Server WMS dan kapabilitas WFS QGIS, Pada Tingkat dan Pembatasan CRS.
- Menu *Macros* untuk membuat modul Python, disimpan ke berkas proyek.qgs akan dimuat dan memiliki spesifik fungsi yang berjalan pada proyek berikut: openProject(), saveProject() dan closeProject().



Macros

☑ Python macros

```
from qgis.utils import iface
from qgis.gui import QgsMessageBar

def openProject():
   msgbar = iface.messageBar()
   msgbar.PushMessage('WARNING', 'project contains sensitive data'
                      'Do not publish',
                      QgsMessageBar.WARNING,10)

def saveProject():
   pass

def closeProject():
   pass
```

Gambar 9.2: Pengaturan Macro di QGIS

9.3 Opsi

Beberapa pilihan dasar untuk QGIS dapat dipilih menggunakan dialog *Opsi*. Pilih menu opsi *Pengaturan* → *Opsi*. Menu di mana Anda dapat mengoptimalkan opsi Anda:

9.3.1 Menu Umum

Aplikasi

- Pilih *Gaya (QGIS diperlukan restart)* …▼ dan pilih diantara 'Oxygen','Windows','Motif','CDE', 'Plastique' dan 'Cleanlux' (🐧).
- Definisikan *Ikon tema* …▼. Sekarang hanya 'default'.
- Definisikan *Ukuran Ikon* …▼.
- Definisikan *Font*. Pilih antara ● *QT default* dan font user-defined.
- Ubah *Timeout for timed messages or dialogs* …▼.
- ☑ *Sembunyikan layar splash saat startup*
- ☑ *Tampilkan Petunjuk saat startup*
- ☑ *Judul tebal kotak grup*
- ☑ *QGIS-styled kotak grup*
- ☑ *Gunakan dialog pemilih warna live-updating*

Berkas proyek

- *Buka proyek pada peluncuran* …▼ (memilih antara 'Baru'. 'Terbaru' dan 'Khusus'. Ketika memilih 'khusus' menggunakan … untuk menentukan proyek)
- ☑ *Buat proyek baru dari proyek default*. Anda memiliki kemungkinan untuk menekan *Atur proyek sekarang sebagai default* atau pada *Reset default*. Anda dapat menelusuri melalui berkas-berkas dan menentukan direktori dimana Anda menemukan pengguna-ditetapkan proyek template Anda. Akan ada sebuah entri di *Project → Baru dari Template* jika Anda pertama kali mengaktifkan ☑ *Buat proyek baru dari proyek default* dan kemudian simpan proyek dalam folder proyek template.
- ☑ *Prompt untuk menyimpan proyek dan sumber data perubahan bila diperlukan*
- ☑ *Peringatkan ketika membuka berkas proyek yang disimpan dengan versi lama dari |qg|*
- *Aktifkan macro* …▼. Opsi ini diciptakan untuk menangani macro yang ditulis untuk melakukan aksi

pada proyek. Anda bisa memilih diantara 'Tidak pernah', 'Bertanya', 'Hanya untuk sesi ini' dan 'Selalu (tidak direkomendasikan)'.

9.3.2 Menu Sistem

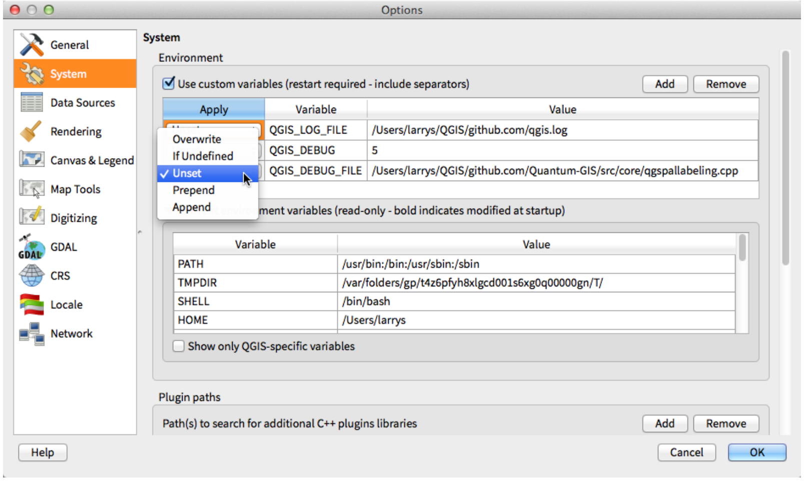
Lingkungan

Sistem lingkungan variabel saat ini dapat dilihat dan banyak dikonfigurasi dalam menu **Lingkungan** (lihat figure_environment_variables). Hal ini berguna untuk platform, seperti Mac, di mana aplikasi GUI tidak selalu mewarisi lingkungan shell pengguna. Ini juga berguna untuk pengaturan / melihat lingkungan variabel untuk mengatur alat eksternal yang dikendalikan oleh pengolahan toolbox, seperti GRASS; dan, untuk menyalakan keluaran debugging untuk bagian tertentu dari kode sumber.

- ☑ *Gunakan penyesuaian variabel (dibutuhkan restart - termasuk pemisah)*. Anda bisa *Tambah* dan *Hapus* variabel. *Ligkungan variabel sekarang →* ditampilkan dibawah dan ini memungkinkan ☑ *Tampilkan hanya variabel spesifik-QGIS*.

Plugin path

- *Tambah* atau *Hapus Path(s) untuk mencari tambahan C++ librari Plugin*



System

Environment

☑ Use custom variables (restart required - include separators)

Apply	Variable	Value
	QGIS_LOG_FILE	/Users/larrys/QGIS/github.com/qgis.log
	QGIS_DEBUG	5
	QGIS_DEBUG_FILE	/Users/larrys/QGIS/github.com/Quantum-GIS/src/core/qgspallabeling.cpp

ment variables (read-only - bold indicates modified at startup)

Variable	Value
PATH	/usr/bin:/bin:/usr/sbin:/sbin
TMPDIR	/var/folders/gp/t4z6pfyh8xlgcd001s6xg0q00000gn/T/
SHELL	/bin/bash
HOME	/Users/larrys

☐ Show only QGIS-specific variables

Plugin paths

Path(s) to search for additional C++ plugins libraries

Gambar 9.3: Sistem lingkungan variabel dalam QGIS

9.3.3 Menu sumber data

Atribut dan tabel fitur

- ☑ *Buka tabel atribut di dock window (dibutuhkan restart QGIS)*
- ☑ *Salin geometri di representasi WKT dari tabel atribut*. Ketika menggunakan Salin baris yang dipilih ke papan klip dari menu *Tabel atribut* kemudian ini memiliki hasil yang juga koordinat titik atau simpul disalin ke papan klip.
- *Perilaku tabel atribut* . Ada tiga kemungkinan: 'Tampilkan semua fitur', 'Tampilkan fitur dipilih' dan 'Tampilkan fitur terlihat pada peta'
- *Tabel atribut baris cache* . Baris cache ini memungkinkan untuk menyimpan baris x atribut terakhir dimuat sehingga proses tabel atribut akan lebih cepat. Cache akan dihapus ketika menutup tabel atribut.
- *Representasi untuk nilai NULL* Here you can define a value for data fields containing a NULL value. Di sini Anda dapat menentukan nilai untuk bidang data yang berisi nilai NULL.

Menangani sumber data

- *Pindai item yang valid di dock Browser* . Anda dapat memilih antara 'Periksa ekstensi' dan 'Periksa isi berkas'.
- *Pindai isi dari berkas yang dikompresi (.zip) di browser dock* . 'Tidak', 'Pindai dasar' and 'Pindai ful' memungkinkan.
- *Konfirmasi subl-lapisan raster saat membuka*. Beberapa raster mendukung sublapisan - mereka disebut subdataset di GDAL. Contohnya adalah berkas netcdf - jika ada banyak variabel netcdf, GDAL melihat setiap variabel sebagai sub dataset. Pilihan ini untuk mengontrol bagaimana menangani sub-lapisan ketika sebuah berkas dengan sub-lapisan dibuka. Anda memiliki pilihan berikut:
  - 'Selalu': selalu bertanya (jika ada sub-lapisan yang ada)
  - 'Jika diperlukan': menanyakan apakah lapisan tidak memiliki band, namun memiliki sub-lapisan
  - 'Tidak Pernah': tidak pernah meminta, tidak akan memuat apa-apa
  - 'Muat semua': tidak pernah meminta, tetapi memuat semua sub-lapisan
- ☑ *Abaikan deklarasi encoding shapefile*. Jika shapefile punya pengkodean informasi ini akan diabaikan oleh QGIS.
- ☑ *Tambahkan lapisan PostGIS dengan klik ganda dan pilih dalam mode diperpanjang*

- ☑ *Tambahkan lapisan Oracle with dobel klik dan pilih dalam mode diperpanjang*

9.3.4 Menu Rendering

Kualitas rendering

- ☑ *Membuat garis tampil kurang bagus dengan mengorbankan beberapa kinerja menggambar*
- ☑ *Memperbaiki masalah poligon salah diisi*

Raster-raster

- dengan *RGB band seleksi* Anda bisa menetapkan nomor dari band Merah, Hijau dan Biru.

Peningkatan kontras

- *Band abu-abu tunggal* ...▼. Sebuah band abu-abu tunggal dapat memiliki 'Tidak ada peregangan', 'Lakukan peregangan untuk MinMax', 'Peregangan dan Klip ke MinMax' dan juga 'Clip ke MinMax'
- *band multi warna (byte/band)* ...▼. 'Tidak ada peregangan', 'Lakukan peregangan untuk MinMax', 'Peregangan dan Klip ke MinMax' dan juga 'Clip ke MinMax'
- *band multi warna (>byte/band)* ...▼. 'Tidak ada peregangan', 'Lakukan peregangan untuk MinMax', 'Peregangan dan Klip ke MinMax' dan juga 'Clip ke MinMax'
- *Batas (minimum/maksimum)* ...▼. 'Kumulatif jumlah potong pixel', 'Minimum/Maksimum', 'Berarti +/- standar deviasi'
- *Kumulatif batas jumlah potong pixel*
- *Standar deviasi multiplier*

Debugging

- *Tampilkan peristiwa ini dalam panel Log Pesan (di bawah tab render):* ☑ *Refresh kanvas peta*

9.3.5 Menu Kanvas dan Legenda

Standar penampilan peta (diganti oleh proyek properti)

- Tetapkan *Seleksi warna* dan *Warna latar*.

Legenda lapisan

- *Dobel klik pada legenda* ...▼. Anda dapat 'Buka properti lapisan' atau 'Buka atribut tabel' dengan dobel klik.
- mengikuti *Gaya item legenda*
  - ☑ *Nama lapisan kapital*
  - ☑ *Nama lapisan tebal*
  - ☑ *Nama grup tebal*
  - ☑ *Tampilkan klasifikasi nama atribut*
  - ☑ *Buat ikon raster (mungkin lambat)*
  - ☑ *Tambah lapisan baru ke grup sekarang atau yang dipilih*

9.3.6 Menu perangkat Peta

Identifikasi

- ☑ *Buka hasil identifikasi di dock window (dibutuhkan restart QGIS)*
- Pengaturan *Mode* menentukan lapisan akan ditampilkan oleh alat Identifikasi. Dengan beralih ke 'Top down' atau 'Top down, stop at first' dan bukan 'Current layer' atribut untuk semua lapisan diidentifikasi (lihat bagian properti Proyek di bawah: *Proyek* untuk mengatur lapisan yang dapat diidentifikasi) akan ditampilkan dalam alat Identifikasi.
- ☑ *Buka form fitur, jika fitur tunggal teridentifikasi*
- Tentukan *Cari radius untuk mengidentifikasi dan menampilkan petunjuk peta sebagai persentase dari lebar peta.*

Alat pengukuran

- Tentukan *Warna Rubberband* untuk peralatan pengukuran
- Tentukan *Tempat desimal*
- ☑ *Perlu satuan dasar*
- *Satuan pengukuran dipilih* ● ('meter' atau 'kaki'
- *Satuan sudut yang dipilih* ● ('Sudut', 'Radian' atau 'Gon')

Menggeser dan memperbesar

- Tentukan *Aksi roda tetikus* ▼ ('Perbesar', 'Perbesar dan pusat', 'Perbesar pada kursor tetikus', 'Tidak ada')
- Tentukan *Faktor pembesaran* untuk roda tetikus

Skala yang ditentukan

Di sini Anda menemukan daftar skala yang telah ditentukan. Dengan tombol '+' dan '-' Anda dapat menambahkan atau menghapus skala individu Anda.

9.3.7 Menu Digitalisasi

Membuat fitur

- ☑ *Menekan atribut jendela pop-up setelah setiap fitur dibuat*
- ☑ *Gunakan kembali nilai atribut terakhir yang dimasukkan*
- *Validasi geometris*. Mengedit garis/poligon kompleks dengan banyak node menyebabkan render sangat lambat. Hal ini karena prosedur standar validasi di QGIS dapat menghabiskan banyak waktu. Untuk mempercepat rendering itu dengan memilih validasi geometri GEOS (mulai dari GEOS 3.3) atau untuk mematikannya. Validasi geometri GEOS jauh lebih cepat, tetapi merugikan adalah bahwa hanya masalah geometri pertama akan dilaporkan.

Rubberband

- Tentukan Rubberband *Lebar garis* dan *Warna garis*

Snapping

- ☑ *Buka opsi mengambil di dock window (dibutuhkan restart QGIS)*
- Tentukan *Mode standar snap* ▼ ('Simpul', 'Segmen', 'Simpul dan Segmen', 'Mati')
- Tentukan *Default toleransi snapping* dalam satuan peta atau pixel
- Tentukan *Cari radius untuk suntingan simpul* dalam satuan peta atau pixel

Penanda simpul

- ☑ *Tampilkan penanda hanya untk fitur yang dipilih*
- Tentukan simpul *Gaya Penanda* ▾ (‘Palang’ (standar), ‘Lingkaran semi transparan’ atau ‘Tidak ada’)
- Tentukan simpul *Ukuran Penanda*

Alat ofset kurva

3 pilihan berikutnya mengacu pada Kurva Ofset alat di *Advanced digitizing*. Melalui berbagai pengaturan, ini mungkin untuk mempengaruhi bentuk garis ofset. Pilihan-pilhan ini dari GEOS 3.3.

- *Gabung gaya untuk ofset kurva*
- *Segmen Quadrant untuk ofset kurva*
- *Batas Miter untuk ofset kurva*

9.3.8 Menu GDAL

GDAL adalah data pertukaran librari untuk berkas raster. Dalam tab ini Anda dapat *Edit opsi membuat* dan *Edit Opsi Pyramid* dari format raster. Menentukan driver GDAL yang akan digunakan untuk format raster seperti dalam beberapa kasus lebih dari satu driver GDAL tersedia.

9.3.9 Menu CRS

CRS standar untuk proyek baru

- ☑ *Secara otomatis mengaktifkan ‘on the fly’ proyeksi ulang jika lapisan memiliki beda CRS*
- ☑ *Aktfikan proyeksi ulang on the fly secara standar*
- Pilih sebuah CRS dan *Selalui mulai proyek baru dengan CRS ini*

CRS untuk lapisan baru

Daerah ini memungkinkan untuk menentukan tindakan, ketika sebuah lapisan baru dibuat, atau ketika lapisan tanpa CRS dimuat.

- ● *Konfirmasi CRS*
- ○ *Gunakan CRS proyek*
- ○ *Gunakan standar CRS ditampilkan dibawah ini*

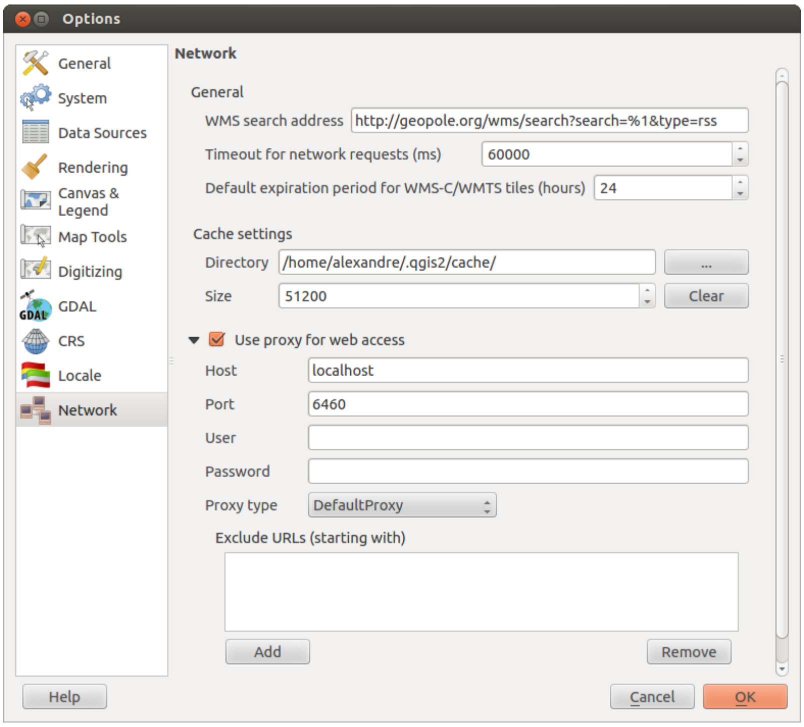
9.3.10 Tab Lokal

- ☑ *Timpah sistem lokal* dan *Lokal gunakan sebagai pengganti*
- Informasi tentang sistem lokal aktif

9.3.11 Tab Jaringan

Umum

- Tentukan *WMS cari alamat*, default `http://geopole.org/wms/search?search=\%1\&type=rss`
- Tentukan *Timeout untuk permintaan jaringan (ms)* - default 60000
- Tentukan *Standar periode ekspirasi untuk WMSC/WMTS (jam)* - default 24



Network

General

WMS search address: http://geopole.org/wms/search?search=%1&type=rss

Timeout for network requests (ms): 60000

Default expiration period for WMS-C/WMTS tiles (hours): 24

Cache settings

Directory: /home/alexandre/.qgis2/cache/

Size: 51200

☑ Use proxy for web access

Host: localhost

Port: 6460

User

Password

Proxy type: DefaultProxy

Exclude URLs (starting with)

Gambar 9.4: Pengaturan-proxy di QGIS

Pengaturan cache

Tentukan *Direktori* dan *Ukuran* untuk cache.

- ☑ *Gunakan proxy untuk akses web* dan tentukan ‘Host’, ‘Port’, ‘Pengguna’, and ‘Kata Sandi’.
- Atur *Tipe Proxy* sesuai dengan kebutuhan Anda.
  - *Proxy Standar*: Proxy ditentukan berdasarkan aplikasi pengaturan menggunakan proxy
  - *Socks5Proxy*: Proxy generik untuk setiap jenis koneksi. Mendukung TCP, UDP, mengikat ke port (koneksi masuk) dan otentikasi.
  - *HttpProxy*: Menggunakan perintah “CONNECT”, mendukung hanya koneksi TCP; mendukung otentikasi.
  - *HttpCachingProxy*: Menggunakan perintah normal HTTP, itu hanya berguna dalam konteks permintaan HTTP
  - *FtpCachingProxy*: Menggunakan proxy FTP, itu hanya berguna dalam konteks permintaan FTP

Tidak termasuk beberapa URL dapat ditambahkan ke kotak teks di bawah pengaturan-proxy (lihat Figure_Network_Tab).

Jika Anda membutuhkan informasi lebih rinci tentang pengaturan-proxy yang berbeda, silakan lihat panduan QT-librari-dokumentasi di http://doc.trolltech.com/4.5/qnetworkproxy.html#ProxyType-enum.

Tip: Menggunakan Proxi

Menggunakan proxi kadang-kadang bisa rumit. Hal ini berguna untuk ‘coba dan eror’ jenis proxi di atas dan memeriksa apakah mereka berhasil dalam kasus Anda.

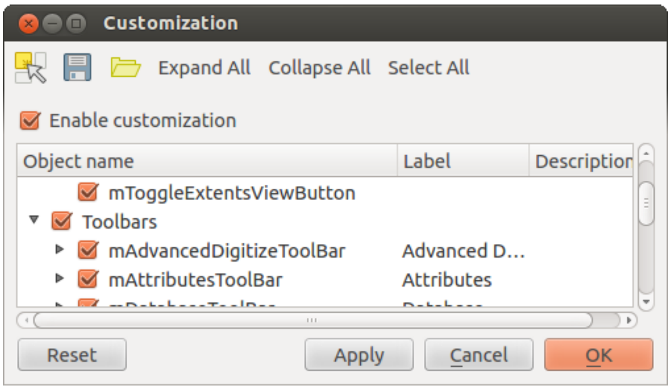
Anda dapat mengubah pilihan sesuai dengan kebutuhan Anda. Beberapa perubahan mungkin memerlukan restart QGIS sebelum berjalan efektif.

- Pengaturan tersimpan di berkas teks: `$HOME/.config/QGIS/qgis.conf`

- Anda dapat menemukan pengaturan Anda di `$HOME/Library/Preferences/org.qgis.qgis.plist`
- pengaturan terkirim ke registri: `HKEY\CURRENT_USER\Software\QGIS\qgis`

9.4 Penyesuaian (Customization)

Alat penyesuaian memungkinkan Anda mengaktifkan (dan nonaktif) hampir setiap elemen dalam antar muka QGIS. Hal ini bisa sangat berguna jika Anda memiliki banyak plugin yang dipasang bahwa Anda tidak pernah menggunakan dan mengisi layar Anda.


Customization
Expand All
Collapse All
Select All
Enable customization
Object name
Label
Description
mToggleExtentsViewButton
Toolbars
mAdvancedDigitizeToolBar
Advanced D...
mAttributesToolBar
Attributes
Reset
Apply
Cancel
OK

Gambar 9.5: Dialog penyesuaian

Penyesuaian QGIS dibagi menjadi lima kelompok. Dalam ☑ *Menu* Anda dapat menyembunyikan entri dalam Menu bar. Dalam ☑ *Panel* Anda dapat menemukan Panel jendela. Jendela Panel adalah aplikasi yang dapat dimulai dan digunakan sebagai mengambang, jendela tingkat-atas atau tertanam ke jendela utama QGIS sebagai widget. (lihat juga *Panel dan Toolbar*). Dalam fitur ☑ *Status Bar* seperti informasi koordinat dapat dinonaktifkan. Dalam ☑ *Toolbars* Anda dapat mengaktifkan (non aktif) ikon toolbar QGIS dan ☑ *Widgets* Anda dapat mengaktifkan (non aktif) dialog serta tombol mereka.

Dengan Beralih ke penangkapan widget dalam aplikasi utama Anda dapat mengklik elemen dalam QGIS Anda ingin menyembunyikan dan menemukan entri yang sesuai (lihat figure_customization). Anda juga dapat menyimpan berbagai setup yang berbeda untuk kasus penggunaan yang berbeda juga. Sebelum perubahan diterapkan, Anda harus me-restart QGIS.

BAB 10

Working with Projections

QGIS allows users to define a global and project-wide CRS (Coordinate Reference System) for layers without a pre-defined CRS. It also allows the user to define custom coordinate reference systems and supports on-the-fly (OTF) projection of vector and raster layers. All these features allow the user to display layers with different CRS and have them overlay properly.

10.1 Overview of Projection Support

QGIS has support for approximately 2,700 known CRS. Definitions for each of these CRS are stored in a SQLite database that is installed with QGIS. Normally you do not need to manipulate the database directly. In fact, doing so may cause projection support to fail. Custom CRS are stored in a user database. See Section *Custom Coordinate Reference System* for information on managing your custom coordinate reference systems.

The CRS available in QGIS are based on those defined by the European Petroleum Search Group (EPSG) and the Institut Geographique National de France (IGNF) and are largely abstracted from the spatial reference tables used in GDAL. EPSG identifiers are present in the database and can be used to specify a CRS in QGIS.

In order to use OTF projection, your data must contain information about its coordinate reference system or you have to define a global, layer or project-wide CRS. For PostGIS layers QGIS uses the spatial reference identifier that was specified when the layer was created. For data supported by OGR, QGIS relies on the presence of a recognized means of specifying the CRS. In the case of shapefiles, this means a file containing the Well Known Text (WKT) specification of the CRS. This projection file has the same base name as the shapefile and a prj extension. For example, a shapefile named `alaska.shp` would have a corresponding projection file named `alaska.prj`.

Whenever you select a new CRS, the used layer units will automatically be changed in the *General* menu of the *Project Properties* dialog under the *Project* (Gnome, OSX) or *Settings* (KDE, Windows) menu.

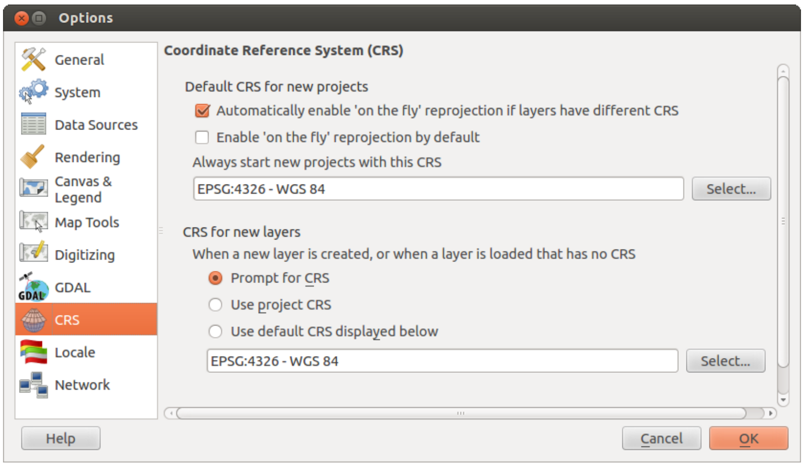
10.2 Global Projection Specification

QGIS starts each new project using the global default projection. The global default CRS is EPSG:4326 - WGS 84 (`proj=longlat +ellps=WGS84 +datum=WGS84 +no_defs`) and comes predefined in QGIS. This default can be changed using the **[Select...]** button in the first section, used to defining the Default Coordinate Reference System to use when starting new projects, as shown in figure_projection_1. This choice will be saved for use in subsequent QGIS sessions.

When you use layers that do not have a CRS, you need to define how QGIS responds to these layers. This can be done globally or project-wide in the *CRS* menu under *Settings* → *Options*.

The options shown in figure_projection_1 are:

- ○ *Prompt for CRS*
- ○ *Use project CRS*



Coordinate Reference System (CRS)

Default CRS for new projects

☑ Automatically enable 'on the fly' reprojection if layers have different CRS

☐ Enable 'on the fly' reprojection by default

Always start new projects with this CRS

EPSG:4326 - WGS 84

CRS for new layers

When a new layer is created, or when a layer is loaded that has no CRS

● Prompt for CRS

○ Use project CRS

○ Use default CRS displayed below

EPSG:4326 - WGS 84

Gambar 10.1: CRS tab in the QGIS Options Dialog

- ○ *Use default CRS displayed below*

If you want to define the coordinate reference system for a certain layer without CRS information, you can also do that in the *General* menu of the raster (see *General Menu*) and vector (see *General Menu*) properties dialog. If your layer already has a CRS defined, it will be displayed as shown in *Vector Layer Properties Dialog* .

Tip: CRS in the Map Legend

Right-clicking on a layer in the Map Legend (Section *Legenda Peta*) provides two CRS short cuts. *Set layer CRS* takes you directly to the Coordinate Reference System Selector dialog (see figure_projection_2). *Set project CRS from Layer* redefines the project CRS using the layer's CRS

10.3 Define On The Fly (OTF) Reprojection

QGIS supports OTF reprojection for both raster and vector data. However, OTF is not activated by default. To use OTF projection, you must activate the ☑ *Enable on the fly CRS transformation* checkbox in the *CRS* menu of the *Project Properties* dialog.

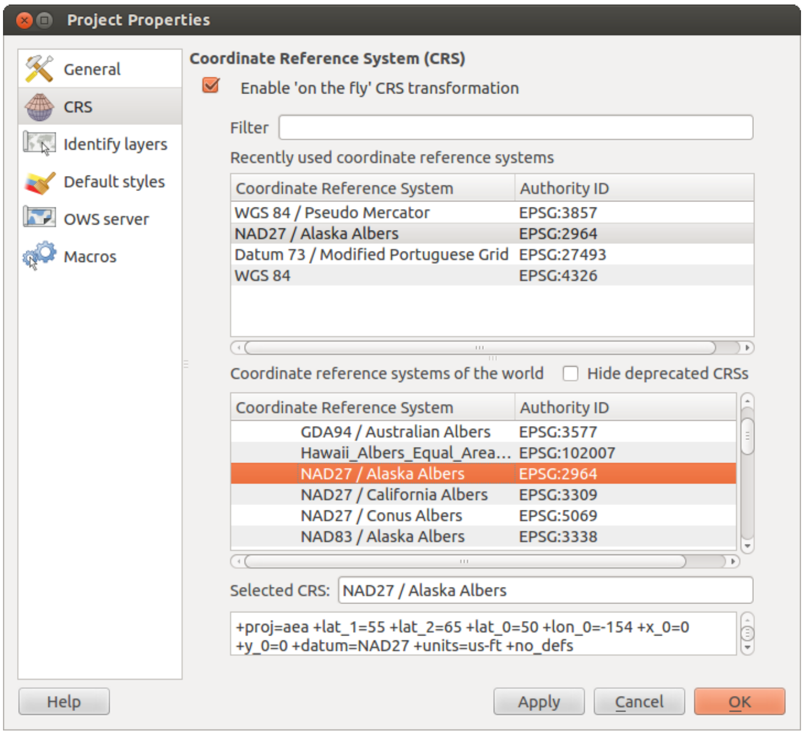
There are three ways to achieve this end:

1. Select *Project Properties* from the *Project* (Gnome, OSX) or *Settings* (KDE, Windows) menu.
2. Click on the CRS status icon in the lower right-hand corner of the statusbar.
3. Turn OTF on by default, by selecting the *CRS* tab of the *Options* dialog and selecting ☑ *Enable 'on the fly' reprojection by default*.

If you have already loaded a layer, and want to enable OTF projection, the best practice is to open the *Coordinate Reference System* menu of the *Project Properties* dialog, select a CRS, and activate the ☑ *Enable on the fly CRS transformation* checkbox. The CRS status icon will no longer be greyed-out and all layers will be OTF projected to the CRS shown next to the icon.

The *Coordinate Reference System* menu of the *Project Properties* dialog contains five important components as shown in Figure_projection_2 and described below.

1. **Enable on the fly CRS transformation** - this checkbox is used to enable or disable OTF projection. When off, each layer is drawn using the coordinates as read from the data source and the components described below are inactive. When on, the coordinates in each layer are projected to the coordinate reference system defined for the map canvas.



Coordinate Reference System (CRS)

☑ Enable 'on the fly' CRS transformation

Filter

Recently used coordinate reference systems

Coordinate Reference System	Authority ID
WGS 84 / Pseudo Mercator	EPSG:3857
NAD27 / Alaska Albers	EPSG:2964
Datum 73 / Modified Portuguese Grid	EPSG:27493
WGS 84	EPSG:4326

Coordinate reference systems of the world ☐ Hide deprecated CRSs

Coordinate Reference System	Authority ID
GDA94 / Australian Albers	EPSG:3577
Hawaii_Albers_Equal_Area...	EPSG:102007
NAD27 / Alaska Albers	EPSG:2964
NAD27 / California Albers	EPSG:3309
NAD27 / Conus Albers	EPSG:5069
NAD83 / Alaska Albers	EPSG:3338

Selected CRS: NAD27 / Alaska Albers

+proj=aea +lat_1=55 +lat_2=65 +lat_0=50 +lon_0=-154 +x_0=0 +y_0=0 +datum=NAD27 +units=us-ft +no_defs

Gambar 10.2: Project Properties Dialog

2. **Coordinate Reference System** - this is a list of all CRS supported by QGIS, including Geographic, Projected and Custom coordinate reference systems. To define a CRS, select it from the list by expanding the appropriate node and selecting the CRS. The active CRS is preselected.
3. **Proj4 text** - this is the CRS string used by the Proj4 projection engine. This text is read-only and provided for informational purposes.
4. **Filter** - if you know the EPSG code, the identifier or the name for a Coordinate Reference System, you can use the search feature to find it. Enter the EPSG code, the identifier or the name.
5. **Recently used CRS** - if you have certain CRS that you frequently use in your everyday GIS work, these will be displayed in the table at the bottom of the Projection Dialog. Click on one of these buttons to select the associated CRS.

Tip: Project Properties Dialog

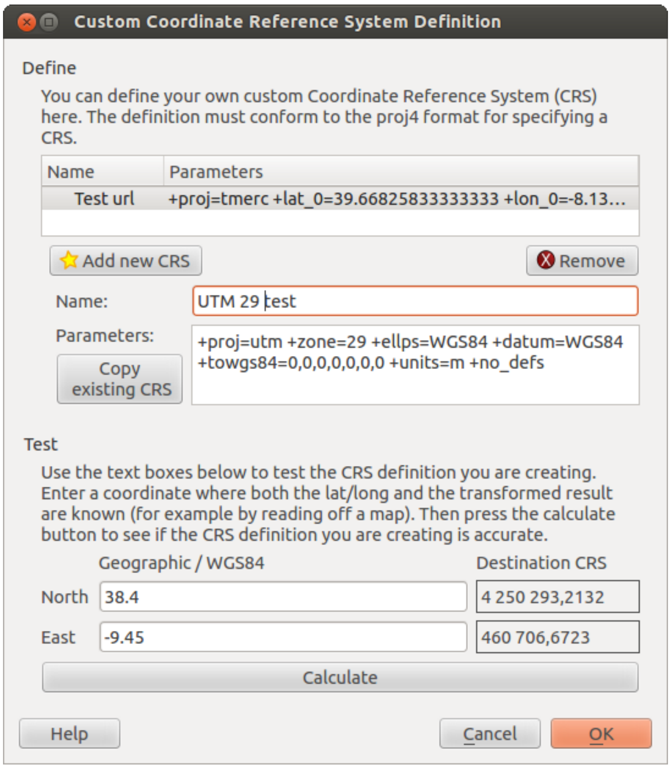
If you open the *Project Properties* dialog from the *Project* (Gnome, OSX) or *Settings* (KDE, Windows) menu, you must click on the *CRS* menu to view the Coordinate Reference System settings.

The CRS status icon will also automatically bring the *CRS* menu to the front.

10.4 Custom Coordinate Reference System

If QGIS does not provide the coordinate reference system you need, you can define a custom CRS. To define a CRS, select *Custom CRS* from the *Settings* menu. Custom CRS are stored in your QGIS user database. In addition to your custom CRS, this database also contains your spatial bookmarks and other custom data.

Defining a custom CRS in QGIS requires a good understanding of the Proj.4 projection library. To begin, refer to the Cartographic Projection Procedures for the UNIX Environment - A User's Manual by Gerald I. Evenden, U.S. Geological Survey Open-File Report 90-284, 1990 (available at ftp://ftp.remotesensing.org/proj/OF90-284.pdf).



Custom Coordinate Reference System Definition

Define

You can define your own custom Coordinate Reference System (CRS) here. The definition must conform to the proj4 format for specifying a CRS.

Name	Parameters
Test url	+proj=tmerc +lat_0=39.66825833333333 +lon_0=-8.13...

Name: UTM 29 test

Parameters: +proj=utm +zone=29 +ellps=WGS84 +datum=WGS84 +towgs84=0,0,0,0,0,0,0 +units=m +no_defs

Test

Use the text boxes below to test the CRS definition you are creating. Enter a coordinate where both the lat/long and the transformed result are known (for example by reading off a map). Then press the calculate button to see if the CRS definition you are creating is accurate.

	Geographic / WGS84	Destination CRS
North	38.4	4 250 293,2132
East	-9.45	460 706,6723

Gambar 10.3: Custom CRS Dialog 🐧

This manual describes the use of the `proj.4` and related command line utilities. The cartographic parameters used with `proj.4` are described in the user manual and are the same as those used by QGIS.

The *Custom Coordinate Reference System Definition* dialog requires only two parameters to define a user CRS:

1. a descriptive name and
2. the cartographic parameters in PROJ.4 format.

To create a new CRS, click the ☆ New button and enter a descriptive name and the CRS parameters. After that you can save your CRS by clicking the 💾 Save button.

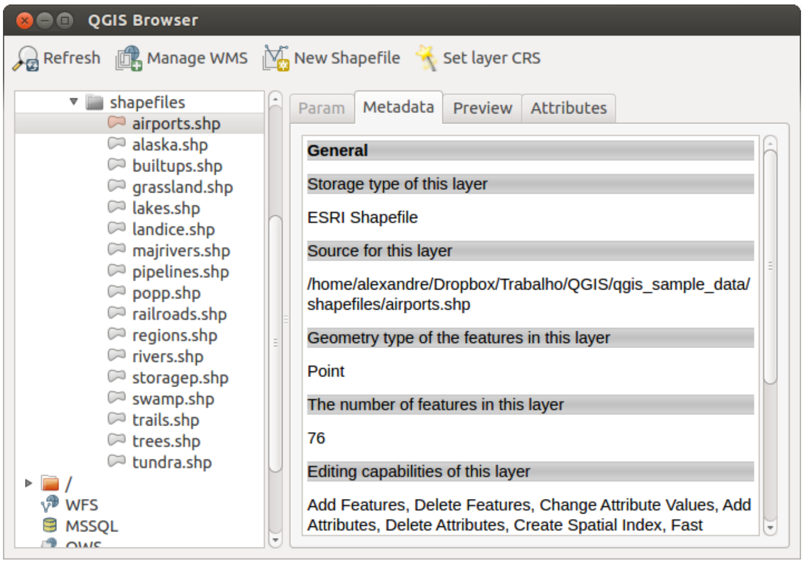
Note that the *Parameters* must begin with a `+proj=`-block, to represent the new coordinate reference system.

You can test your CRS parameters to see if they give sane results by clicking on the **[Calculate]** button inside the *Test* block and pasting your CRS parameters into the *Parameters* field. Then enter known WGS 84 latitude and longitude values in *North* and *East* fields respectively. Click on **[Calculate]** and compare the results with the known values in your coordinate reference system.

BAB 11

QGIS Peramban

Peramban QGIS adalah panel di QGIS yang memungkinkan Anda dengan mudah menavigasi dalam basisdata Anda. Anda memiliki akses ke berkas-berkas vektor umum (seperti berkas ESRI shapefile atau MapInfo), basisdata (seperti PostGIS, Oracle, Spatialite atau MSSQL Spatial) dan koneksi WMS/WFS. Anda juga bisa melihat data GRASS Anda (untuk mendapatkan data ke QGIS lihat *GRASS GIS Integration*)


QGIS Browser
Refresh
Manage WMS
New Shapefile
Set layer CRS
shapefiles
airports.shp
alaska.shp
builtups.shp
grassland.shp
lakes.shp
landice.shp
majrivers.shp
pipelines.shp
popp.shp
railroads.shp
regions.shp
rivers.shp
storagep.shp
swamp.shp
trails.shp
trees.shp
tundra.shp
/
WFS
MSSQL
OWS
Param
Metadata
Preview
Attributes

General

Storage type of this layer

ESRI Shapefile

Source for this layer

/home/alexandre/Dropbox/Trabalho/QGIS/qgis_sample_data/shapefiles/airports.shp

Geometry type of the features in this layer

Point

The number of features in this layer

76

Editing capabilities of this layer

Add Features, Delete Features, Change Attribute Values, Add Attributes, Delete Attributes, Create Spatial Index, Fast

Gambar 11.1: Penjelajah QGIS merupakan aplikasi standalone

Menggunakan penjelajah QGIS untuk menampilkan data Anda. Fungsi geser dan taruh membuatnya mudah untuk menempatkan data Anda ke tampilan peta dan legenda peta.

1. Mengaktifkan penjelajah QGIS. Klik-kanan pada toolbar dan klik ☑ *Peramban* atau pilih dari *Pengaturan* → *Panel*.
2. Geser panel kedalam jendela legenda
3. Klik pada tab *Peramban*
4. Jelajahi dalam basisdata Anda dan pilih folder shapefile dari qgis_sample_data.
5. Tekan tombol `Shift` dan klik pada airports.shp dan alaska.shp .
6. Tekan tombol kiri tetikus kemudian geser dan tempatkan berkas ke dalam kanvas peta.
7. Klik-kanan pada lapisan dan pilih *Atur CRS proyek dari lapisan*. Untuk informasi lebih lanjut lihat *Working with Projections*.
8. Klik pada Perbesar Full agar lapisan-lapisan terlihat.

Ada peramban kedua yang tersedia di *Settings* → *Panel*. Fungsi tambahan seperti Tambah Lapisan Terpilih dan Saring Berkas fungsi disisipkan.

1. Mengaktifkan penjelajah QGIS kedua: Klik-kanan pada toolbar dan klik ☑ *Peramban (2)* .
2. Geser panel kedalam jendela legenda
3. Arahkan ke tab *Peramban (2)* dan temukan shapefile di dalam sistem berkas Anda.
4. Pilih sebuah berkas dengan tombol kiri tetikus. Kini Anda bisa menggunakan ikon Tambah Lapisan Terpilih. Gunakan ikon untuk dapat bekerja dengan berkas QGIS tanpa banyak usaha.

QGIS otomatis terlihat untuk Coordinate Reference System (CRS) dan perbesar ke batas lapisan jika Anda bekerja di sebuah proyek kosong QGIS. Jika sudah ada berkas dalam proyek Anda, berkas hanya akan ditambahkan dan dalam kasus itu memiliki tingkat yang sama dan CRS akan divisualisasikan. Jika berkas ini telah mendapat CRS lain dan lapisan Anda terlebih dahulu klik kanan pada lapisan dan pilih *Atur CRS Proyek dari Lapisan*. Kemudian pilih *Perbesar ke Batas Lapisan*.

Fungsi Saring Berkas bekerja pada level direktori. Jelajahi folder dimana Anda ingin menyaring berkas-berkas dan memberikan kata pencarian atau wildcard. Penjelajah hanya menampilkan nama berkas yang sesuai dari data lain tidak akan ditampilkan kemudian.

Ini juga mungkin untuk menjalankan peramban QGIS sebagai aplikasi mandiri.

Mulai Peramban QGIS

- ketik di dalam “qbrowser” di perintah prompt.
- Memulai peramban QGIS menggunakan menu Start atau shortcut dekstop, atau dobel klik pada berkas proyek QGIS.
- Peramban X QGIS juga tersedia di fodler Aplikasi Anda.

Dalam figure_browser_standalone_metadata Anda bisa melihat ditingkatkan fungsi peramban QGIS. Tab *Param* menyediakan detail dari koneksi dataset seperti PostGIS atau MSSQL Spatial. Tab *Metadata* berisi informasi umum tentang berkas (lihat *Metadata Menu*). Dengan tab *Preview* Anda bisa melihat-lihat di berkas Anda tanpa mengimpor mereka ke proyek QGIS Anda. Ini juga mungkin untuk melihat atribut berkas Anda dalam tab *Atribut*

BAB 12

Pekerjaan dengan Data Vektor

12.1 Supported Data Formats

QGIS uses the OGR library to read and write vector data formats including ESRI Shapefiles, MapInfo, Microstation file formats and many more. GRASS vector, PostGIS, MSSQL Spatial and Oracle Spatial support is supplied by native QGIS data providers. Vector data can also be loaded in read mode from zip and gzip archives into QGIS. At the date of this document, 69 vector formats are supported by the OGR library (see OGR-SOFTWARE-SUITE *Literatur dan Referensi Web*). The complete list of supported vector data formats by the OGR library (see OGR-SOFTWARE-SUITE *Literatur dan Referensi Web*) is available at http://www.gdal.org/ogr/ogr_formats.html.

Catatan: Not all of the listed formats may work in QGIS for various reasons. For example, some require external commercial libraries or the GDAL/OGR installation of your OS was not build to support the format you want to use. Only those formats that have been well tested will appear in the list of file types when loading a vector into QGIS. Other untested formats can be loaded by selecting `*.*`.

Working with GRASS vector data is described in Section *GRASS GIS Integration*.

This section describes how to work with several common formats: ESRI Shapefiles, PostGIS layers, SpatiaLite layers, OpenStreetMap vectors etc. Many of the features available in QGIS work the same, regardless of the vector data source. This is by design and includes the identify, select, labeling and attributes functions.

12.1.1 ESRI Shapefiles

The standard vector file format used in QGIS is the ESRI Shapefile. Support is provided by the OGR Simple Feature Library (http://www.gdal.org/ogr/).

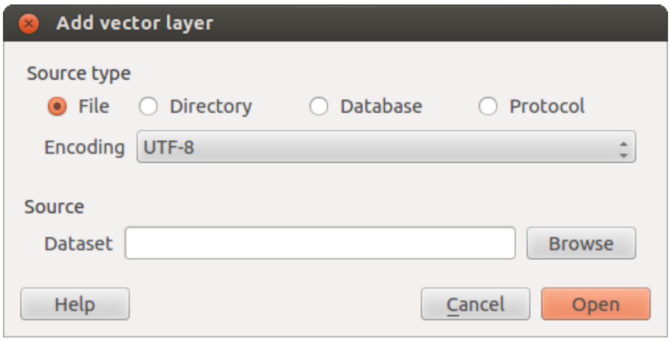
A shapefile actually consists of several files. The following three are required:

1. `.shp` file containing the feature geometries.
2. `.dbf` file containing the attributes in dBase format.
3. `.shx` index file.

Shapefiles also can include a file with a `.prj` suffix, which contains the projection information. While it is very useful to have a projection file, it is not mandatory. A shapefile dataset can contain additional files. For further details see the ESRI technical specification at: http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf.

Loading a Shapefile

To load a shapefile, start QGIS and click on the Add Vector Layer toolbar button or simply type `Ctrl+Shift+V`. This will bring up a new window (see figure_vector_1).


Add vector layer
Source type
Source
Dataset
Browse
Help
Cancel
Open

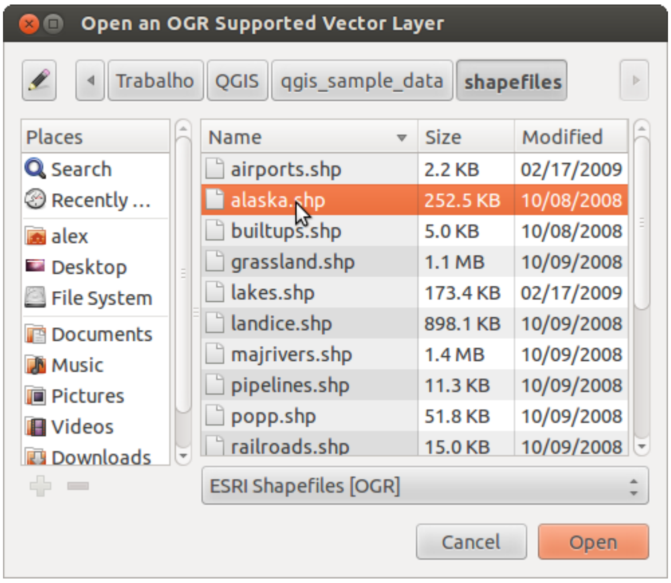
Source type: ● File ○ Directory ○ Database ○ Protocol

Encoding: UTF-8

Gambar 12.1: Add Vector Layer Dialog 🐧

From the available options check ● *File*. Click on button **[Browse]**. That will bring up a standard open file dialog (see figure_vector_2) which allows you to navigate the file system and load a shapefile or other supported data source. The selection box *Filter* … ▾ allows you to preselect some OGR supported file formats.

You can also select the Encoding type for the shapefile if desired.


Open an OGR Supported Vector Layer
Trabalho
QGIS
qgis_sample_data
shapefiles
Places
Search
Recently …
alex
Desktop
File System
Documents
Music
Pictures
Videos
Downloads
Cancel
Open

Name	Size	Modified
airports.shp	2.2 KB	02/17/2009
alaska.shp	252.5 KB	10/08/2008
builtups.shp	5.0 KB	10/08/2008
grassland.shp	1.1 MB	10/09/2008
lakes.shp	173.4 KB	02/17/2009
landice.shp	898.1 KB	10/09/2008
majrivers.shp	1.4 MB	10/09/2008
pipelines.shp	11.3 KB	10/09/2008
popp.shp	51.8 KB	10/09/2008
railroads.shp	15.0 KB	10/09/2008

ESRI Shapefiles [OGR]

Gambar 12.2: Open an OGR Supported Vector Layer Dialog 🐧

Selecting a shapefile from the list and clicking **[Open]** loads it into QGIS. Figure_vector_3 shows QGIS after loading the `alaska.shp` file.

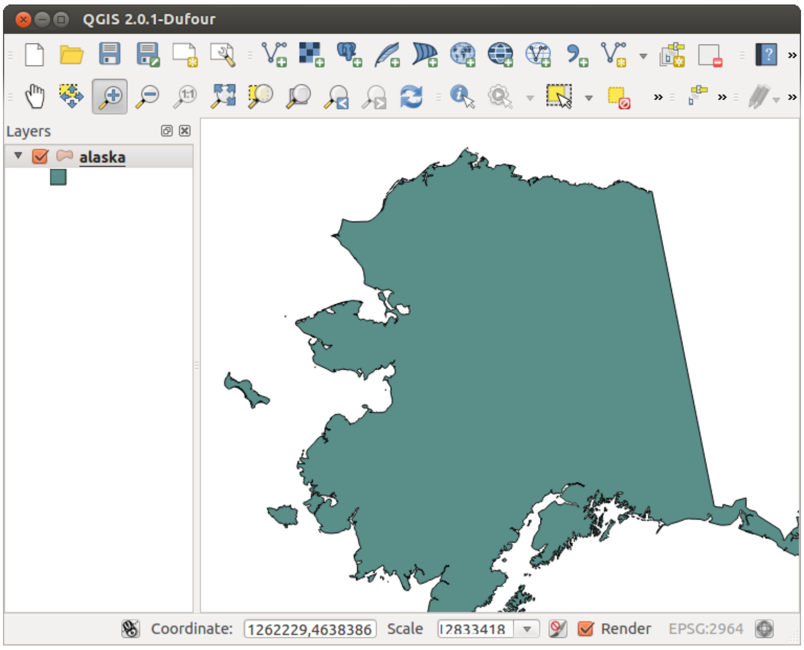
Tip: Layer Colors

When you add a layer to the map, it is assigned a random color. When adding more than one layer at a time, different colors are assigned to each layer.

Once loaded, you can zoom around the shapefile using the map navigation tools. To change the style of a layer, open the *Layer Properties* dialog by double clicking on the layer name or by right-clicking on the name in the legend and choosing *Properties* from the popup menu. See Section *Style Menu* for more information on setting symbology of vector layers.

Tip: Load layer and project from mounted external drives on OS X

On OS X, portable drives that are mounted besides the primary hard drive do not show up under *File* → *Open Project* as expected. We are working on a more OSX-native open/save dialog to fix this. As a workaround you can



Coordinate: 1262229,4638386 Scale 12833418 EPSG:2964

Gambar 12.3: QGIS with Shapefile of Alaska loaded

type '/Volumes' in the File name box and press `return`. Then you can navigate to external drives and network mounts.

Improving Performance for Shapefiles

To improve the performance of drawing a shapefile, you can create a spatial index. A spatial index will improve the speed of both zooming and panning. Spatial indexes used by QGIS have a `.qix` extension.

Use these steps to create the index:

- Load a shapefile, clicking on the Add Vector Layer toolbar button or type `Ctrl+Shift+V`.
- Open the *Layer Properties* dialog by double-clicking on the shapefile name in the legend or by right-clicking and choosing *Properties* from the popup menu.
- In the tab *General* click the **[Create Spatial Index]** button.

Problem loading a shape .prj file

If you load a shapefile with `.prj` file and QGIS is not able to read the coordinate reference system from that file, you have to define the proper projection manually within the *General* tab of the *Layer Properties* dialog of the layer by clicking the **[Specify...]** button. This is due to the fact, that `.prj` files often do not provide the complete projection parameters, as used in QGIS and listed in the *CRS* dialog.

For that reason, if you create a new shapefile with QGIS, two different projection files are created. A `.prj` file with limited projection parameters, compatible with ESRI software, and a `.qpj` file, providing the complete parameters of the used CRS. Whenever QGIS finds a `.qpj` file, it will be used instead of the `.prj`.

12.1.2 Loading a MapInfo Layer

To load a MapInfo layer, click on the Add Vector Layer toolbar button or type `Ctrl+Shift+V`, change the file type filter *Filter* : to 'Mapinfo File [OGR]' and select the MapInfo layer you want to load.

12.1.3 Loading an ArcInfo Binary Coverage

To load an ArcInfo binary coverage, click on the Add Vector Layer toolbar button or press `Ctrl+Shift+V` to open the *Add Vector Layer* dialog. Select ● *Directory*. Change to *Filter* to 'Arc/Info Binary Coverage'. Navigate to the directory that contains the coverage files and select it.

Similarly, you can load directory based vector files in the UK National Transfer Format as well as the raw TIGER Format of the US Census Bureau.

12.1.4 Loading OpenStreetMap Vectors

QGIS integrates Openstreetmap import as a core functionnality.

- To connect to the OSM server and download data, open the menu *Vector → Openstreetmap → Load data*. You can skip this step if you already got a .osm XML file using josm or overpass or any other source.
- The menu *Vector → Openstreetmap → Import topology from an XML file* will convert your .osm file into a spatialite database, and create a db connection.
- The menu *Vector → Openstreetmap → Export topology to Spatialite* then allows you to open the database connection, select the type of data you want (points, lines, or polygons) and choose tags to import. This creates a spatialite geometry layer that you can then add to your project by clicking on the Add SpatiaLite Layer toolbar button or by selecting the *Add SpatiaLite Layer...* option from the *Layer* menu, see Section *SpatiaLite Layers*.

12.1.5 PostGIS Layers

PostGIS layers are stored in a PostgreSQL database. The advantages of PostGIS are the spatial indexing, filtering and query capabilities it provides. Using PostGIS, vector functions such as select and identify work more accurately than with OGR layers in QGIS.

Creating a stored Connection

The first time you use a PostGIS data source, you must create a connection to the PostgreSQL database that contains the data. Begin by clicking on the Add PostGIS Layer toolbar button, selecting the *Add PostGIS Layer...* option from the *Layer* menu or typing `Ctrl+Shift+D`. You can also open the *Add Vector Layer* dialog and select ● *Database*. The *Add PostGIS Table(s)* dialog will be displayed. To access the connection manager, click on the **[New]** button to display the *Create a New PostGIS Connection* dialog. The parameters required for a connection are:

- **Name**: A name for this connection. Can be the same as *Database*
- **Service**: Service parameter to be used alternatively to hostname/port (and potentially database). This can be defined in `pg_service.conf`
- **Host**: Name of the database host. This must be a resolvable host name the same as would be used to open a telnet connection or ping the host. If the database is on the same computer as QGIS, simply enter *'localhost'* here.
- **Port**: Port number the PostgreSQL database server listens on. The default port is 5432.
- **Database**: Name of the database.
- **SSL mode**: How the SSL connection will be negotiated with the server. Note that massive speedups in PostGIS layer rendering can be achieved by disabling SSL in the connection editor. Following options are available:
  - disable: only try an unencrypted SSL connection

  - allow: try a non-SSL connection, if that fails, try an SSL connection
  - prefer (the default): try an SSL connection, if that fails, try a non-SSL connection;
  - require: only try an SSL connection.
- **Username**: User name used to login to the database.
- **Password**: Password used with *Username* to connect to the database.

Optional you can activate following checkboxes:

- ☑ *Save Username*
- ☑ *Save Password*
- ☑ *Only look in the geometry_columns table*
- ☑ *Don't resolve type of unrestricted columns (GEOMETRY)*
- ☑ *Only look in the 'public' schema*
- ☑ *Also list tables with no geometry*
- ☑ *Use estimated table metadata*

Once all parameters and options are set, you can test the connection by clicking on the **[Test Connect]** button.

Tip: QGIS User Settings and Security

Depending on your computing environment, storing passwords in your QGIS settings may be a security risk. Your customized settings for QGIS are stored based on the operating system:

- 🐧, the settings are stored in your home directory in `.qgis2/`.
- 🪟, the settings are stored in the registry.

Loading a PostGIS Layer

Once you have one or more connections defined, you can load layers from the PostgreSQL database. Of course this requires having data in PostgreSQL. See Section *Importing Data into PostgreSQL* for a discussion on importing data into the database.

To load a layer from PostGIS, perform the following steps:

- If the *Add PostGIS layers* dialog is not already open, selecting the *Add PostGIS Layer...* option from the *Layer* menu or typing `Ctrl+Shift+D` opens the dialog.
- Choose the connection from the drop-down list and click **[Connect]**.
- Select or unselect ☑ *Also list tables with no geometry*
- Optionally use some ☑ *Search Options* to define which features to load from the layer or use the **[Build query]** button to start the *Query builder* dialog.
- Find the layer(s) you wish to add in the list of available layers.
- Select it by clicking on it. You can select multiple layers by holding down the `Shift` key while clicking. See Section *Query Builder* for information on using the PostgreSQL Query Builder to further define the layer.
- Click on the **[Add]** button to add the layer to the map.

Tip: PostGIS Layers

Normally a PostGIS layer is defined by an entry in the geometry_columns table. From version 0.9.0 on, QGIS can load layers that do not have an entry in the geometry_columns table. This includes both tables and views. Defining a spatial view provides a powerful means to visualize your data. Refer to your PostgreSQL manual for information on creating views.

Some details about PostgreSQL layers

This section contains some details on how QGIS accesses PostgreSQL layers. Most of the time QGIS should simply provide you with a list of database tables that can be loaded, and load them on request. However, if you have trouble loading a PostgreSQL table into QGIS, the information below may help you understand any QGIS messages and give you direction on changing the PostgreSQL table or view definition to allow QGIS to load it.

QGIS requires that PostgreSQL layers contain a column that can be used as a unique key for the layer. For tables this usually means that the table needs a primary key, or a column with a unique constraint on it. In QGIS, this column needs to be of type int4 (an integer of size 4 bytes). Alternatively the ctid column can be used as primary key. If a table lacks these items, the oid column will be used instead. Performance will be improved if the column is indexed (note that primary keys are automatically indexed in PostgreSQL).

If the PostgreSQL layer is a view, the same requirement exists, but views do not have primary keys or columns with unique constraints on them. You have to define a primary key field (has to be integer) in the QGIS dialog before you can load the view. If a suitable column cannot does not exist in the view, QGIS will not load the layer. If this occurs, the solution is to alter the view so that it does include a suitable column (a type of integer and either a primary key or with a unique constraint, preferably indexed).

QGIS offers a checkbox **Select at id** that is activated by default. This option gets the ids without the attributes which is faster in most cases. It can make sense to disable this option when you use expensive views.

12.1.6 Importing Data into PostgreSQL

Data can be imported into PostgreSQL/PostGIS using several tools, such as the SPIT plugin or the command line tools shp2pgsql or ogr2ogr.

DB Manager

QGIS comes with a core plugin named DB Manager. It can be used to load shapefiles and other data formats and includes support for schemas. See Section *Plugin Pengelola DB* for more information.

shp2pgsql

PostGIS includes an utility called **shp2pgsql** that can be used to import shapefiles into a PostGIS enabled database. For example, to import a shapefile named `lakes.shp` into a PostgreSQL database named `gis_data`, use the following command:

```
shp2pgsql -s 2964 lakes.shp lakes_new | psql gis_data
```

This creates a new layer named `lakes_new` in the `gis_data` database. The new layer will have a spatial reference identifier (SRID) of 2964. See Section *Working with Projections* for more information on spatial reference systems and projections.

Tip: Exporting datasets from PostGIS

Like the import-tool **shp2pgsql** there is also a tool to export PostGIS-datasets as shapefiles: **pgsql2shp**. This is shipped within your PostGIS distribution.

---

ogr2ogr

Beside **shp2pgsql** and **DB Manager** there is another tool for feeding geodata in PostGIS: **ogr2ogr**. This is part of your GDAL installation.

To import a shapefile into PostGIS, do the following:

```
ogr2ogr -f "PostgreSQL" PG:"dbname=postgis host=myhost.de user=postgres \
password=topsecret" alaska.shp
```

This will import the shapefile `alaska.shp` into the PostGIS-database *postgis* using the user *postgres* with the password *topsecret* on host server *myhost.de*.

Note that OGR must be built with PostgreSQL to support PostGIS. You can see this by typing

```
ogrinfo --formats | grep -i post
```

If you like to use PostgreSQL's **COPY** -command instead of the default **INSERT INTO** method you can export the following environment-variable (at least available on 🐧 and X):

```
export PG_USE_COPY=YES
```

ogr2ogr does not create spatial indexes like **shp2pgsl** does. You need to create them manually using the normal SQL-command **CREATE INDEX** afterwards as an extra step (as described in the next section *Improving Performance*).

Improving Performance

Retrieving features from a PostgreSQL database can be time consuming, especially over a network. You can improve the drawing performance of PostgreSQL layers by ensuring that a PostGIS spatial index exists on each layer in the database. PostGIS supports creation of a GiST (Generalized Search Tree) index to speed up spatial searches of the data (GiST index information is taken from the PostGIS documentation available at http://postgis.refractions.net).

The syntax for creating a GiST index is:

```
CREATE INDEX [indexname] ON [tablename]
  USING GIST ( [geometryfield] GIST_GEOMETRY_OPS );
```

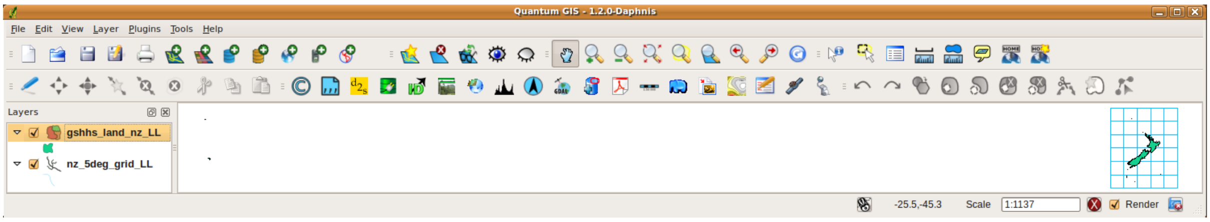
Note that for large tables, creating the index can take a long time. Once the index is created, you should perform a `VACUUM ANALYZE`. See the PostGIS documentation (POSTGIS-PROJECT *Literatur dan Referensi Web*) for more information.

The following is an example of creating a GiST index:

```
gsherman@madison:~/current$ psql gis_data
Welcome to psql 8.3.0, the PostgreSQL interactive terminal.

Type:  \copyright for distribution terms
       \h for help with SQL commands
       \? for help with psql commands
       \g or terminate with semicolon to execute query
       \q to quit

gis_data=# CREATE INDEX sidx_alaska_lakes ON alaska_lakes
gis_data-# USING GIST (the_geom GIST_GEOMETRY_OPS);
CREATE INDEX
gis_data=# VACUUM ANALYZE alaska_lakes;
VACUUM
gis_data=# \q
gsherman@madison:~/current$
```

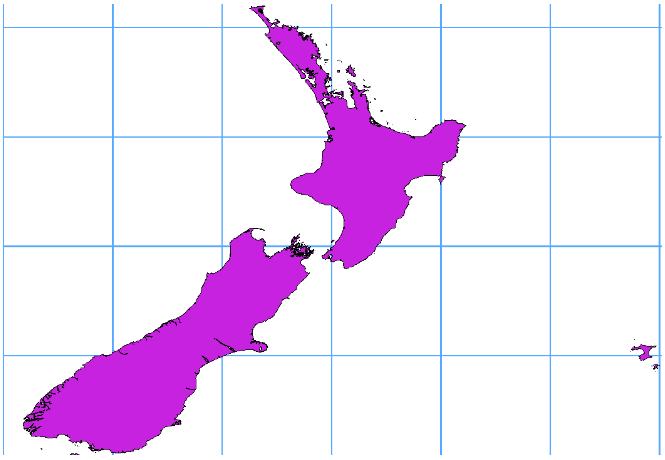
12.1.7 Vector layers crossing 180° longitude

Many GIS packages don't wrap vector maps, with a geographic reference system (lat/lon), crossing the 180 degrees longitude line (http://postgis.refractions.net/documentation/manual-1.4/ST_Shift_Longitude.html). As result, if we open such map in QGIS, we will see two far, distinct locations, that should show near each other. In Figure_vector_4 the tiny point on the far left of the map canvas (Chatham Islands), should be within the grid, right of New Zealand main islands.



Gambar 12.4: Map in lat/lon crossing the 180° longitude line

A workaround is to transform the longitude values using PostGIS and the **ST_Shift_Longitude** function This function reads every point/vertex in every component of every feature in a geometry, and if the longitude coordinate is < 0° adds 360° to it. The result would be a 0° - 360° version of the data to be plotted in a 180° centric map.



Gambar 12.5: Crossing 180° longitude applying the **ST_Shift_Longitude** function

Usage

- Import data to PostGIS (*Importing Data into PostgreSQL*) using for example the DB Manager plugin.
- Use the PostGIS command line interface to issue the following command (this is an example where "TABLE" is the actual name of your PostGIS table)

  ```
  gis_data=# update TABLE set the_geom=ST_Shift_Longitude(the_geom);
  ```

- If everything went right you should receive a confirmation about the number of features that were updated, then you'll be able to load the map and see the difference (Figure_vector_5)

12.1.8 SpatiaLite Layers

The first time you load data from a SpatiaLite database, begin by clicking on the Add SpatiaLite Layer toolbar button or by selecting the *Add SpatiaLite Layer...* option from the *Layer* menu or by typing `Ctrl+Shift+L`.

This will bring up a window, which will allow you to either connect to a SpatiaLite database already known to QGIS, which you can choose from the dropdown menu or to define a new connection to a new database. To define a new connection, click on **[New]** and use the file browser to point to your SpatiaLite database, which is a file with a `.sqlite` extension.

If you want to save a vector layer to SpatiaLite format you can do this by right clicking the layer in the legend. Then click on *Save as..*, define the name of the output file, select 'SpatiaLite' as format and the CRS. Also you can select 'SQLite' as format, and then add `SPATIALITE=YES` in the OGR data source creation option field. This tells OGR to create a SpatiaLite database. See also http://www.gdal.org/ogr/drv_sqlite.html.

QGIS also supports editable views in SpatiaLite.

Creating a new SpatiaLite layer

If you want to create a new SpatiaLite layer, please refer to section *Creating a new SpatiaLite layer*.

Tip: SpatiaLite data management Plugins

For SpatiaLite data management you can also use several Python plugins: QSpatiaLite, SpatiaLite Manager or DB Manager (core plugin, recommended). They can be downloaded and installed with the Plugin Installer.

12.1.9 MSSQL Spatial Layers

QGIS also provides native MS SQL 2008 support. The Add MSSQL Spatial Layer is part of the new toolbar button or available in the MS SQL node in the QBrowser tree, providing drag and drop import support.

12.1.10 ORACLE Spatial Layers

QGIS also provides native ORACLE Locator/Spatial support. The Add ORACLE Spatial Layer is part of the new toolbar button or available in the ORACLE node in the QBrowser tree, providing drag and drop import support. ORACLE Spatial layers are stored in an ORACLE database.

Creating a stored Connection

The first time you use a ORACLE Spatial data source, you must create a connection to the database that contains the data. Begin by clicking on the Add ORACLE Spatial Layer toolbar button, selecting the *Add ORACLE Spatial Layer...* option from the *Layer* menu or typing `Ctrl+Shift+O`. To access the connection manager, click on the **[New]** button to display the *Create a New ORACLE Spatial Connection* dialog. The parameters required for a connection are:

- **Name**: A name for this connection. Can be the same as *Database*
- **Database** SID or SERVICE_NAME of the Oracle instance.
- **Host**: Name of the database host. This must be a resolvable host name the same as would be used to open a telnet connection or ping the host. If the database is on the same computer as QGIS, simply enter *'localhost'* here.
- **Port**: Port number the PostgreSQL database server listens on. The default port is 1521.
- **Username**: User name used to login to the database.
- **Password**: Password used with *Username* to connect to the database.

Optional you can activate following checkboxes:

- ☑ *Save Username* Indicates whether to save the database user name in the connection configuration.

- ☑ *Save Password* Indicates whether to save the database password in the connection settings. Passwords are saved in clear text in the system configuration and in the project files!
- ☑ *Only look in meta data table* Restricts the displayed tables to those that are in the all_sdo_geom_metadata view. This can speed up the initial display of spatial tables.
- ☑ *Only look for user's tables* When searching for spatial tables restrict the search to tables that are owner by the user.
- ☑ *Also list tables with no geometry* Indicates that tables without geometry should also be listed by default.
- ☑ *Use estimated table statistics for the layer metadata* When the layer is setup various metadata is required for the Oracle table. This includes information such as the table row count, geometry type and spatial extents of the data in the geometry column. If the table contains a large number of rows determining this metadata is time consuming. By activating this option the following fast table metadata operations are done: Row count is determined from all_tables.num_rows. Table extents are always determined with the SDO_TUNE.EXTENTS_OF function even if a layer filter is applied. The table geometry is determined from the first 100 non-null geometry rows in the table.
- ☑ *Only existing geometry types* Only list the existing geometry types and don't offer to add others.

Once all parameters and options are set, you can test the connection by clicking on the **[Test Connect]** button.

Tip: QGIS User Settings and Security

Depending on your computing environment, storing passwords in your QGIS settings may be a security risk. Passwords are saved in clear text in the system configuration and in the project files! Your customized settings for QGIS are stored based on the operating system:

- 🐧, the settings are stored in your home directory in `.config/QGIS/QGIS2.conf`.
- ⊞, the settings are stored in the registry.

Loading a ORACLE Spatial Layer

Once you have one or more connections defined, you can load layers from the ORACLE database. Of course this requires having data in ORACLE.

To load a layer from ORACLE Spatial, perform the following steps:

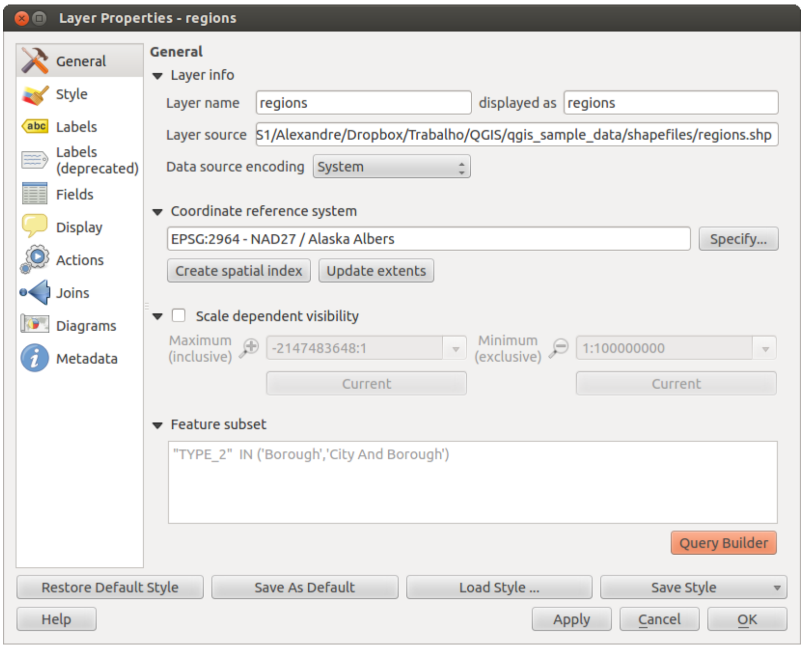
- If the *Add ORACLE Spatial layers* dialog is not already open, click on the Add ORACLE Spatial Layer toolbar button.
- Choose the connection from the drop-down list and click **[Connect]**.
- Select or unselect ☑ *Also list tables with no geometry*
- Optionally use some ☑ *Search Options* to define which features to load from the layer or use the **[Build query]** button to start the *Query builder* dialog.
- Find the layer(s) you wish to add in the list of available layers.
- Select it by clicking on it. You can select multiple layers by holding down the `Shift` key while clicking. See Section *Query Builder* for information on using the ORACLE Query Builder to further define the layer.
- Click on the **[Add]** button to add the layer to the map.

Tip: ORACLE Spatial Layers

Normally an ORACLE Spatial layer is defined by an entry in the **USER_SDO_METADATA** table.

12.2 The Vector Properties Dialog

The *Layer Properties* dialog for a vector layer provides information about the layer, symbology settings and labeling options. If your vector layer has been loaded from a PostgreSQL/PostGIS datastore, you can also alter the underlying SQL for the layer by invoking the *Query Builder* dialog on the *General* tab. To access the *Layer Properties* dialog, double-click on a layer in the legend or right-click on the layer and select *Properties* from the popup menu.


Layer Properties - regions
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
General
Layer info
Coordinate reference system
Specify...
Create spatial index
Update extents
Current
Current
Feature subset
Query Builder
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Layer name: regions
displayed as: regions
Layer source: S1/Alexandre/Dropbox/Trabalho/QGIS/qgis_sample_data/shapefiles/regions.shp
Data source encoding: System
EPSG:2964 - NAD27 / Alaska Albers
☐ Scale dependent visibility
Maximum (inclusive): -2147483648:1
Minimum (exclusive): 1:100000000
"TYPE_2" IN ('Borough','City And Borough')

Gambar 12.6: Vector Layer Properties Dialog

12.2.1 Style Menu

The Style menu provides you with a comprehensive tool for rendering and symbolizing your vector data. You can use *Layer rendering* → tools that are common to all vector data and special symbolizing tools that were designed for the different kinds of vector data.

Layer rendering

- *Layer transparency* : you can make the underlying layer in the map canvas visible with this tool. Use the slider to adapt the visibility of your vector layer to your needs. You can also make a precise definition of the percentage of visibility in the the menu beside the slider.
- *Layer blending mode*: you can achieve special rendering effects with these tools that you previously only know from graphics programs. The pixels of your overlaying and underlaying layers are mixed through the settings described below.
  - Normal: This is the standard blend mode which uses the alpha channel of the top pixel to blend with the Pixel beneath it; the colors aren't mixed
  - Lighten: It selects the maximum of each component from the foreground and background pixels. Be aware that the results tend to be jagged and harsh.
  - Screen: Light pixels from the source are painted over the destination, while dark pixels are not. This mode is most useful for mixing the texture of one layer with another layer. E.g. you can use a hillshade to texture another layer

  - Dodge: Dodge will brighten and saturate underlying pixels based on the lightness of the top pixel. So brighter top pixels cause the saturation and brightness of the underlying pixels to increase. This works best if the top pixels aren't too bright, otherwise the effect is too extreme.
  - Addition: This blend mode simply adds pixel values of one layer with the other. In case of values above 1 (in the case of RGB), white is displayed. This mode is suitable for highlighting features.
  - Darken: Creates a resultant pixel that retains the smallest components of the foreground and background pixels. Like lighten, the results tend to be jagged and harsh
  - Multiply: It multiplies the numbers for each pixel of the top layer with the corresponding pixel for the bottom layer. The results are darker pictures.
  - Burn: Darker colors in the top layer causes the underlying layers to darken. Can be used to tweak and colorise underlying layers.
  - Overlay: Combines multiply and screen blending modes. In the resulting picture light parts of the picture become lighter and dark parts become darker.
  - Soft light: Very similar to overlay, but instead of using multiply/screen it uses color burn/dodge. This one is supposed to emulate shining a soft light onto an image.
  - Hard light: Hard light is very similar to the overlay mode. It's supposed to emulate projecting a very intense light onto an image.
  - Difference: Difference subtracts the top pixel from the bottom pixel or the other way round, to always get a positive value. Blending with black produces no change, as values for all colors are 0.
  - Subtract: This blend mode simply subtracts pixel values of one layer with tshe other. In case of negative values, black is displayed.

Since QGIS 2.0 the old symbology is no longer available. In this version the new symbology has been redesigned and revised.

Renderers

The renderer is responsible for drawing a feature together with the correct symbol. There are four types of renderers: single symbol, categorized, graduated and rule-based. There is no continuous color renderer, because it is in fact only a special case of the graduated renderer. The categorized and graduated renderer can be created by specifying a symbol and a color ramp - they will set the colors for symbols appropriately. For point layers there is a point displacement renderer available. For each data type (points, lines and polygons) vector symbol layer types are available. Depending on the chosen renderer, the *Style* menu provides different following sections. On the bottom right of the symbology dialog there is a **[Symbol]** button which gives access to the Style Manager (see Section vector_style_manager). The Style Manager allows you to edit and remove existing symbols and add new ones.

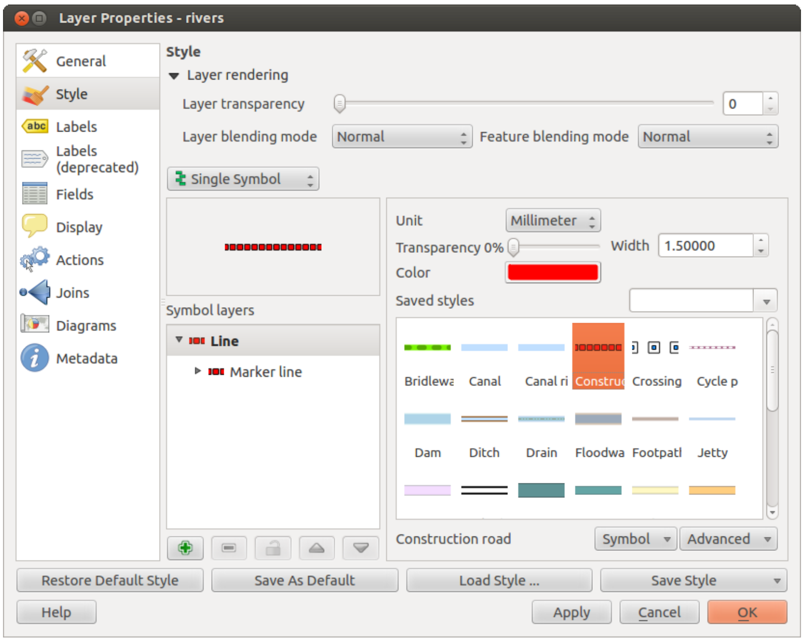
Tip: Select and change multiple symbols

The Symbology allows to select multiple symbols and right click to change color, transparency, size, or width of selected entries.

Single Symbol Renderer

The Single Symbol Renderer is used to render all features of the layer using a single user-defined symbol. The properties, that can be adjusted in the *Style* menu, depend partially on the type of the layer, but all types share the following structure. In the top left part of the menu, there is a preview of the current symbol to be rendered. On the right part of the menu, there is a list of symbols already defined for the current style, prepared to be used via selecting them from the list. The current symbol can be modified using the menu on the right side. If you click on the first level in the *Symbol layers* dialog on the left side it's possible to define basic parameters like *Size*, *Transparency*, *Color* and *Rotation*. Here the layers are joined together.

More detailed settings can be made when clicking on the second level in the *Symbol layers* dialog. You can define *Symbol layers* that are combined afterwards. A symbol can consist of several *Symbol layers*. The following settings are possible:


Layer Properties - rivers
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Style
Layer rendering
Layer transparency
Layer blending mode
Feature blending mode
Single Symbol
Symbol layers
Line
Marker line
Unit
Transparency 0%
Width
Color
Saved styles
Bridleway
Canal
Canal ri
Construc
Crossing
Cycle p
Dam
Ditch
Drain
Floodwa
Footpatl
Jetty
Construction road
Symbol
Advanced
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Layer transparency: 0

Layer blending mode: Normal

Feature blending mode: Normal

Unit: Millimeter

Width: 1.50000

Gambar 12.7: Single symbol line properties

- *Symbol layer type*: You have the possibility to use Ellipse markers, Font markers, Simple markers, SVG markers and Vector Field markers
- *Size*
- *Angle*
- *Colors*
- *Border width*
- *Offset X,Y*: You can shift the symbol in x- or y-direction

Note that once you have set the size in the lower levels the size of the whole symbol can be changed with the *Size* menu in the first level again. The size of the lower levels changes accordingly while the size ratio is maintained. After having done any needed changes, the symbol can be added to the list of current style symbols (using the **[Symbol]** *Save in symbol library*) and then easily be used in the future. Furthermore you can use the **[Save Style]** button to save the symbol as a QGIS layer style file (.qml) or SLD file(.sld). Currently in version 2.0 SLDs can be exported from any type of renderer: single symbol, categorized, graduated or rule-based, but when importing an SLD, either a single symbol or rule-based renderer is created. That means that categorized or graduated styles are converted to rule-based. If you want to preserve those renderers, you have to stick to the QML format. On the other hand, it could be very handy sometimes to have this easy way of converting styles to rule-based. With the *Style manager* from the **[Symbol]** menu you can administrate your symbols. You can add item, edit item, remove item and share item. 'Marker' symbols, 'Line' symbols, 'Fill' patterns and 'Color ramps' can be used to create the symbols (see defining_symbols). The symbols are assigned to 'All Symbols', 'Groups' or 'Smart groups' then.

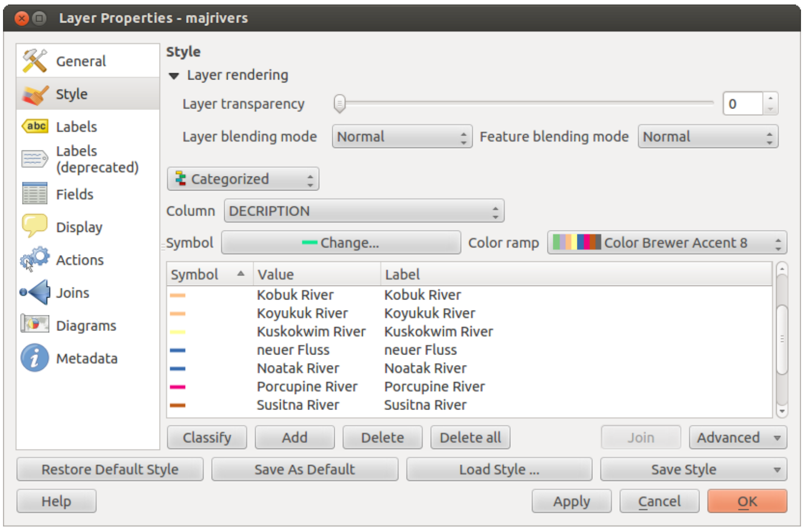
Categorized Renderer

The Categorized Renderer is used to render all features from a layer, using a single user-defined symbol, which color reflects the value of a selected feature's attribute. The *Style* menu allows you to select:

- The attribute (using the Column listbox)
- The symbol (using the Symbol dialog)
- The colors (using the Color Ramp listbox)

The **[Advanced]** button in the lower right corner of the dialog allows to set the fields containing rotation and size scale information. For convenience, the list in the center of the menu lists the values of all currently selected attributes together, including the symbols that will be rendered.

The example in figure_symbology_2 shows the category rendering dialog used for the rivers layer of the QGIS sample dataset.


Layer Properties - majrivers
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Style
Layer rendering
Change...
Classify
Add
Delete
Delete all
Join
Advanced
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Layer transparency: 0

Layer blending mode: Normal

Feature blending mode: Normal

Categorized

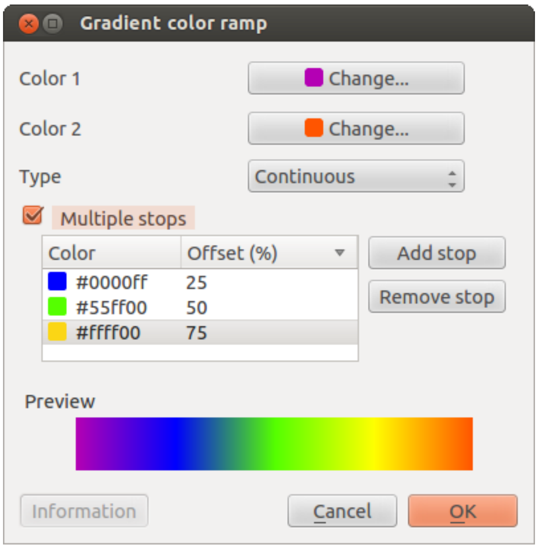
Column: DECRIPTION

Color ramp: Color Brewer Accent 8

Symbol	Value	Label
—	Kobuk River	Kobuk River
—	Koyukuk River	Koyukuk River
—	Kuskokwim River	Kuskokwim River
—	neuer Fluss	neuer Fluss
—	Noatak River	Noatak River
—	Porcupine River	Porcupine River
—	Susitna River	Susitna River

Gambar 12.8: Categorized Symbolizing options

You can create a custom color ramp choosing *New color ramp...* from the *Color ramp* dropdown menu. A dialog will prompt for the ramp type: Gradient, Random, ColorBrewer, and cpt-city. The first three have options for number of steps and/or multiple stops in the color ramp. See figure_symbology_3 for an example of custom color ramp and figure_symbology_3a for the cpt-city dialog.


Gradient color ramp
Color 1
Change...
Color 2
Change...
Add stop
Remove stop
Preview
Information
Cancel
OK

Type: Continuous

☑ Multiple stops

Color	Offset (%)
#0000ff	25
#55ff00	50
#ffff00	75

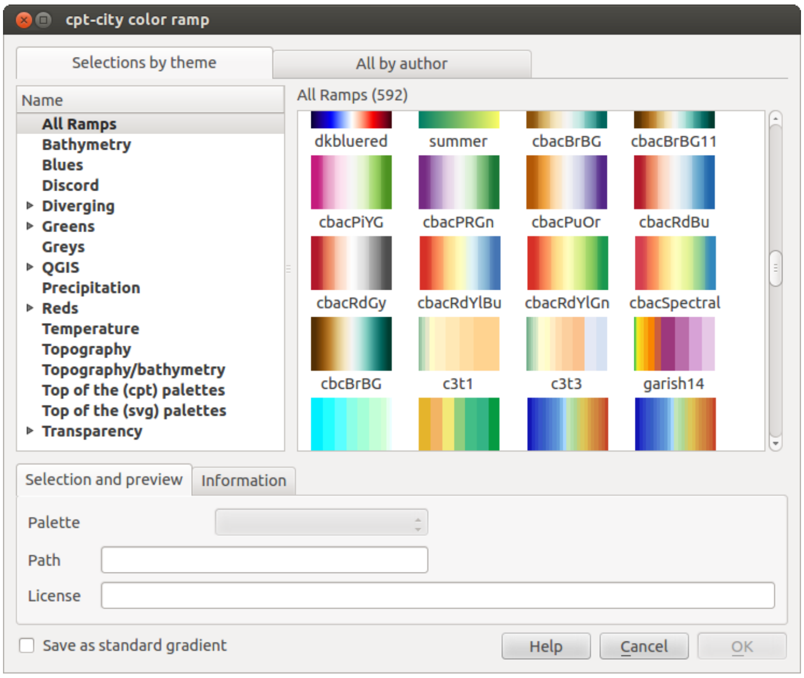
Gambar 12.9: Example of custom gradient color ramp with multiple stops

The cpt-city option opens a new dialog with hundreds of themes included 'out of the box'.

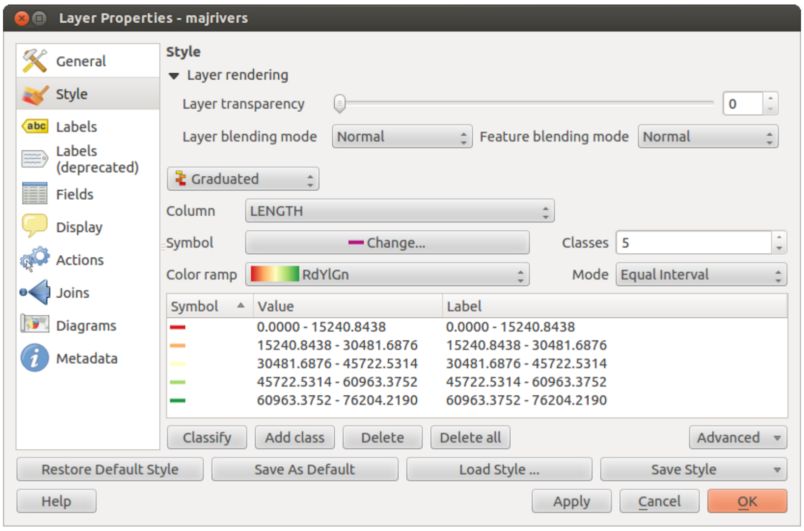
Graduated Renderer

The Graduated Renderer is used to render all the features from a layer, using a single user-defined symbol, whose color reflects the classification of a selected feature's attribute to a class.

Like Categorized Renderer, it allows to define rotation and size scale from specified columns.


cpt-city color ramp
Selections by theme
All by author
Name
All Ramps
Bathymetry
Blues
Discord
Diverging
Greens
Greys
QGIS
Precipitation
Reds
Temperature
Topography
Topography/bathymetry
Top of the (cpt) palettes
Top of the (svg) palettes
Transparency
All Ramps (592)
dkbluered
summer
cbacBrBG
cbacBrBG11
cbacPiYG
cbacPRGn
cbacPuOr
cbacRdBu
cbacRdGy
cbacRdYlBu
cbacRdYlGn
cbacSpectral
cbcBrBG
c3t1
c3t3
garish14
Selection and preview
Information
Palette
Path
License
Save as standard gradient
Help
Cancel
OK

Gambar 12.10: cpt-city dialog with hundreds of color ramps


Layer Properties - majrivers
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Style
Layer rendering
Symbol
Change...
Classify
Add class
Delete
Delete all
Advanced
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Layer transparency: 0

Layer blending mode: Normal

Feature blending mode: Normal

Graduated

Column: LENGTH

Classes: 5

Color ramp: RdYlGn

Mode: Equal Interval

Symbol	Value	Label
🟥	0.0000 - 15240.8438	0.0000 - 15240.8438
🟧	15240.8438 - 30481.6876	15240.8438 - 30481.6876
🟨	30481.6876 - 45722.5314	30481.6876 - 45722.5314
🟩	45722.5314 - 60963.3752	45722.5314 - 60963.3752
🟩	60963.3752 - 76204.2190	60963.3752 - 76204.2190

Gambar 12.11: Graduated Symbolizing options

Analogue to the categorized rendered, the *Style* tab allows you to select:

- The attribute (using the Column listbox)
- The symbol (using the Symbol Properties button)
- The colors (using the Color Ramp list)

Additionally, you can specify the number of classes and also the mode how to classify features inside the classes (using the Mode list). The available modes are:

- Equal Interval
- Quantile
- Natural Breaks (Jenks)
- Standard Deviation
- Pretty Breaks

The listbox in the center part of the *Style* menu lists the classes together with their ranges, labels and symbols that will be rendered.

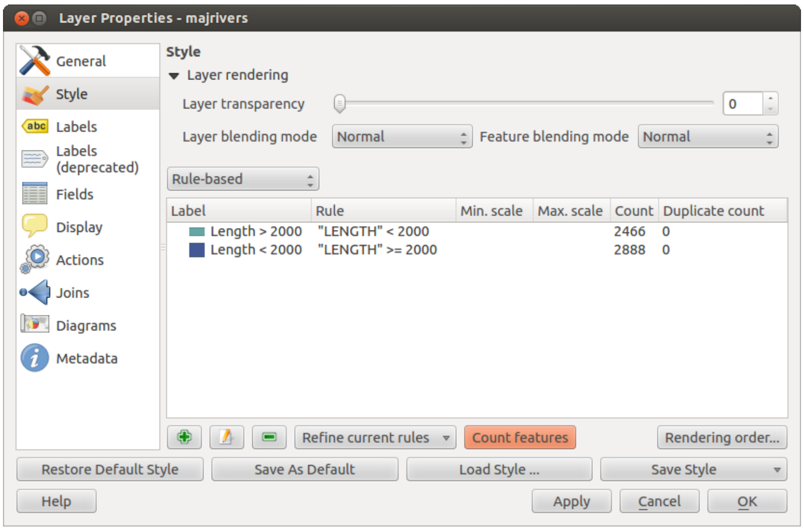
The example in figure_symbology_4 shows the graduated rendering dialog for the rivers layer of the QGIS sample dataset.

Rule-based rendering

The rule-based renderer is used to render all the features from a layer, using rule based symbols, whose color reflects the classification of a selected feature's attribute to a class. The rules are based on SQL statements. The dialog allows rule grouping by filter or scale and you can decide if you want to enable symbol levels or use only first matched rule.

The example in figure_symbology_5 shows the rule-based rendering dialog for the rivers layer of the QGIS sample dataset.

To create a rule, activate an existing row by clicking on it or click on '+' and click on the new rule. Then press the **[Edit rule]** button. In the *Rule properties* dialog you can define a label for the rule. Press the … button to open the Expression builder. In the **Function List**, click on *Fields and Values* to view all attributes of the attribute table to be searched. To add an attribute to the Field calculator **Expression** field, double click its name in the *Fields and Values* list. Generally you can use the various fields, values and functions to construct the calculation expression or you can just type it into the box (see *Field Calculator*).


Layer Properties - majrivers

Style

Layer rendering

Layer transparency 0

Layer blending mode Normal

Feature blending mode Normal

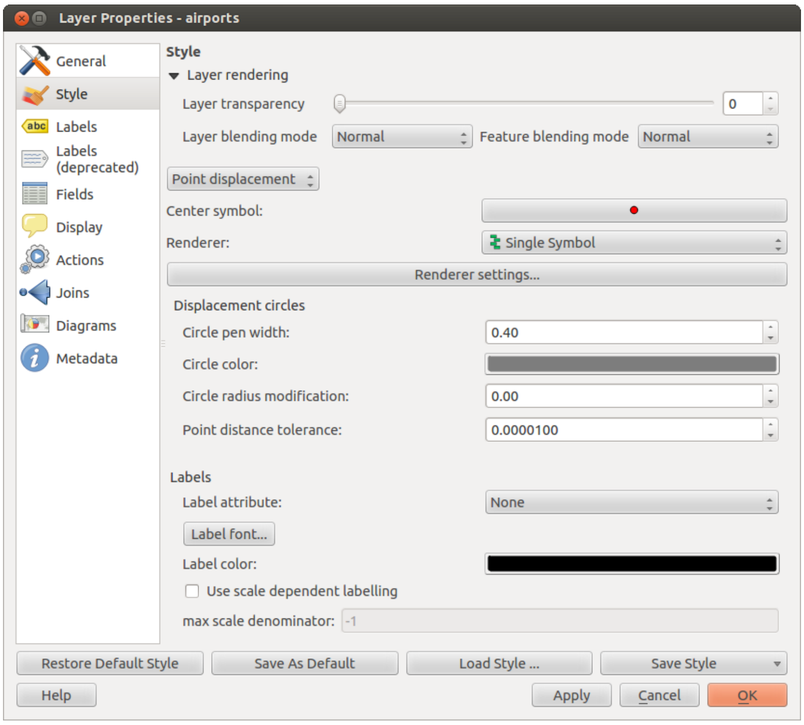
Rule-based

Label	Rule	Min. scale	Max. scale	Count	Duplicate count
🟦 Length > 2000	"LENGTH" < 2000			2466	0
🟦 Length < 2000	"LENGTH" >= 2000			2888	0

Gambar 12.12: Rule-based Symbolizing options

Point displacement

The point displacement renderer offers to visualize all features of a point layer, even if they have the same location. To do this, the symbols of the points are placed on a displacement circle around a center symbol.


Layer Properties - airports
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Style
Layer rendering
Center symbol:
Renderer settings...
Displacement circles
Circle color:
Labels
Label font...
Label color:
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Layer transparency: 0

Layer blending mode: Normal

Feature blending mode: Normal

Point displacement

Renderer: Single Symbol

Circle pen width: 0.40

Circle radius modification: 0.00

Point distance tolerance: 0.0000100

Label attribute: None

☐ Use scale dependent labelling

max scale denominator: -1

Gambar 12.13: Point displacement dialog

Tip: Export vector symbology

You have the possibility to export vector symbology from QGIS into the Google *.kml, *.dxf and MapInfo*.tab files. Just open the right mouse menu of the layer and click on *Save selection as* → to define the name of the output file and its format. Use the *Symbology export* menu to save the symbology either as *Feature symbology* → or as *Symbol layer symbology* →. If you have used symbol layers it is recommended to use the second setting.

12.2.2 Labels Menu

The Labels core application provides smart labeling for vector point, line and polygon layers and only requires a few parameters. This new application also supports on-the-fly transformated layers. The core functions of the application have been redesigned. In QGIS 2.0. there are now a number of other features which improve the labeling. The following menus have been created for labeling the vector layers:

- Text
- Formatting
- Buffer
- Background
- Shadow
- Placement
- Rendering

Let us see how the new menus can be used for various vector layers. **Labeling point layers**

Start QGIS and load a vector point layer. Activate the layer in the legend and click on the abc Layer Labeling Options icon in the QGIS toolbar menu.

First step is to activate the ☑ *Label this layer with* checkbox and select an attribute column to use for labeling. Click ε... if you want to define labels based on expressions.

The following steps describe a simple labeling without using the *Data defined override* functions that are situated next to the drop-down menus.

You can define the text style in the *Text* menu (see Figure_labels_1). A new function is the *Type case* option where you can influence the text rendering. You have the possibility to render the text 'All uppercase', 'All lowercase' or 'Capitalize first letter'. Also, a new function in QGIS 2.0 is the use of blend modes (see blend_modes).

In the *Formatting* menu you can define a character for a line break in the labels with the wrap label on character function. Use the ☑ *Formatted numbers* option to format the numbers in an attribute table. Here decimal places are inserted. If you enable this option three decimal places ist set by default.

To create a buffer just activate ☑ *Draw text buffer* checkbox in the *Buffer* menu. The buffer color is variable. Also, a new function in QGIS 2.0 is the use of blend modes (see blend_modes).

If the ☑ *Color buffer's fill* checkbox is activated, it will interact with partially transparent text and give mixed color transparency results. Turning off the buffer fill fixes that issue (except where the interior aspect of the buffer's stroke intersects with the text's fill) and also allows the user to make outlined text.

In the *Background* menu you can define with *Size X* and *Size Y* the shape of your background. Use *Size type* to insert an additional 'Buffer' into your background. The buffer size one is set by default here. The background then consists of the buffer plus the background in *Size X* and *Size Y*. You can set a *Rotation* where you can choose between 'Sync with label', 'Offset of label' and 'Fixed'. Using 'Offset of label' and 'Fixed' you can rotate the background. Define an *Offset X,Y* with X and Y values and the background will be shifted. When applying *Radius X,Y* the background gets rounded corners. Again, it is possible to mix the background with the underlying layers in the map canvas using the *Blend mode* (see blend_modes).

Use the *Shadow* menu for a user-defined *Drop shadow*. The drawing of the background is very variable. Choose between 'Lowest label component', 'Text', 'Buffer' and 'Background'. The *Offset* angle depends on the orientation of the label. If you choose the ☑ *Use global shadow* checkbox then the zero point of the angle is always oriented to the north and doesn't depend on the orientation of the label. Influence the appearance of the shadow with the *Blur radius*. The higher the number, the softer the shadows.

The appearance of the drop shadow can also be altered by choosing a blend mode (see blend_modes).

Choose the *Placement* menu for the label placement and the labeling priority. Using the ● *Offset from point* setting you now have the possibility to use *Quadrants* to place your label. Additionally you can alter the angle of the label placement with the *Rotation* setting. Thus, a placement in a certain quadrant with a certain rotation is possible.

In the *Rendering* menu you can define label and feature options. In the *Label options* you find the scale-based visibility setting now. You can prevent QGIS from rendering only selected labels with the ☑ *Show all labels for this layer (including colliding labels)* checkbox. In the *Feature options* you can define if every part of a multipart feature is to be labeled. In QGIS 2.0 now it's possible to define if the number of features to be labeled is limited and to ☑ *Discourage labels from covering features*.

Labeling line layers

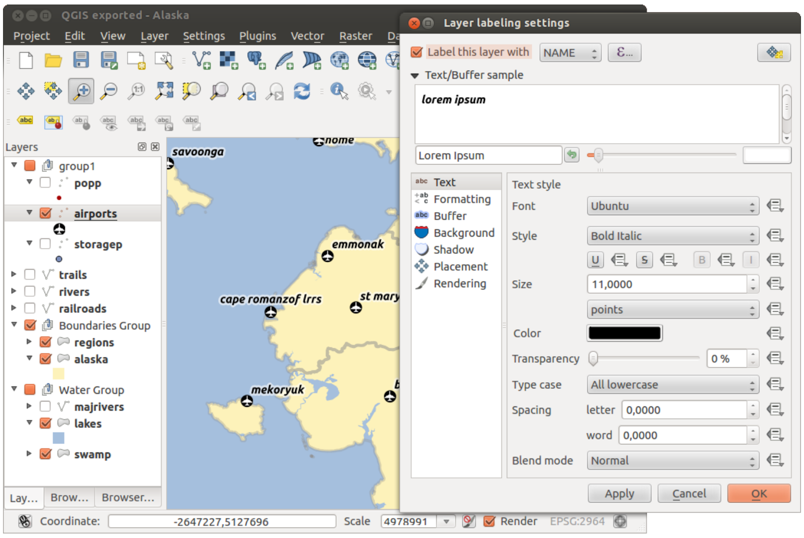
First step is to activate the ☑ *Label this layer* checkbox in the *Label settings* tab and select an attribute column to use for labeling. Click ε... if you want to define labels based on expressions.

After that you can define the text style in the *Text* menu. Here the same settings as for point layers are possible.

Also in the *Formatting* menu the same settings as for point layers are possible.

The *Buffer* menu has the same functions as described in section labeling_point_layers .

The *Background* menu has the same entries as described in section labeling_point_layers .


QGIS exported - Alaska
Project Edit View Layer Settings Plugins Vector Raster
Layers
group1
popp
airports
storagep
trails
rivers
railroads
Boundaries Group
regions
alaska
Water Group
majrivers
lakes
swamp
savoonga
nome
emmonak
cape romanzof lrrs
st mary
mekoryuk
Layer labeling settings
Text/Buffer sample
lorem ipsum
Lorem Ipsum
Text
Formatting
Buffer
Background
Shadow
Placement
Rendering
Apply
Cancel
OK

☑ Label this layer with NAME

Text style

Font: Ubuntu

Style: Bold Italic

Size: 11,0000 points

Transparency: 0 %

Type case: All lowercase

Spacing letter: 0,0000

word: 0,0000

Blend mode: Normal

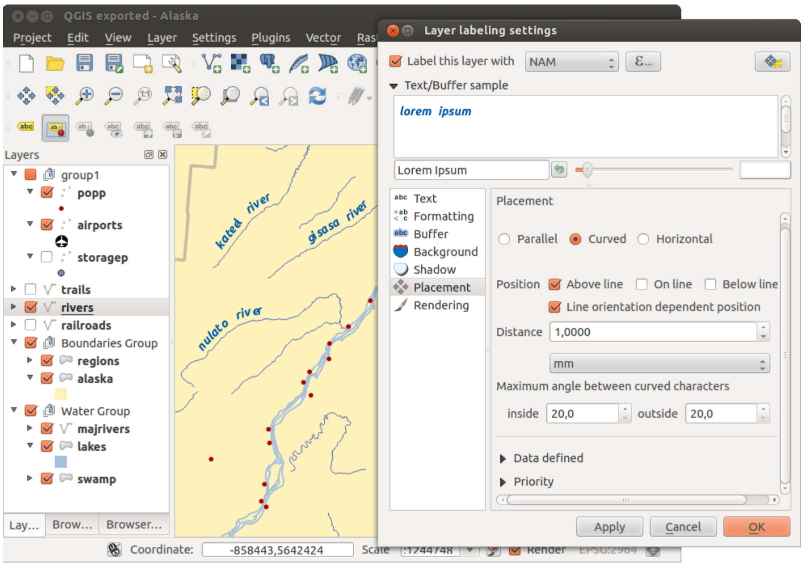
Coordinate: -2647227,5127696 Scale 4978991 ☑ Render EPSG:2964

Gambar 12.14: Smart labeling of vector point layers 🐧

Also the *Shadow* menu has the same entries as described in section labeling_point_layers .

In the *Placement* menu you find special settings for line layers. The label can be placed ● *Parallel*, ○ *Curved* or ○ *Horizontal*. With the ● *Parallel* and ○ *Curved* option come the following settings: You can define the position ☑ *Above line*, ☑ *On line* and ☑ *Below line*. It's possible to select several options at once. QGIS will look for the optimal position of the label then. Remember that here you can also use the line orientation for the position of the label. Additionally you can define a *Maximum angle between curved characters* when selecting the ○ *Curved* option (see Figure_labels_2).

The *Rendering* menu has nearly the same entries as for point layers. In the *Feature options* you can now *Suppress labeling of features smaller than*.


QGIS exported - Alaska
Project Edit View Layer Settings Plugins Vector Ras
Layers
group1
popp
airports
storagep
trails
rivers
railroads
Boundaries Group
regions
alaska
Water Group
majrivers
lakes
swamp
kateel river
gisasa river
nulato river
Layer labeling settings
Text/Buffer sample
lorem ipsum
Lorem Ipsum
Text
Formatting
Buffer
Background
Shadow
Placement
Rendering
Data defined
Priority
Apply
Cancel
OK

☑ Label this layer with NAM

Placement

○ Parallel ● Curved ○ Horizontal

Position ☑ Above line ☐ On line ☐ Below line

☑ Line orientation dependent position

Distance 1,0000 mm

Maximum angle between curved characters

inside 20,0 outside 20,0

Coordinate: -858443,5642424 Scale 1744748

Gambar 12.15: Smart labeling of vector line layers 🐧

Labeling polygon layers

First step is to activate the ☑ *Label this layer* checkbox and select an attribute column to use for labeling. Click ε… if you want to define labels based on expressions.

In *Text* menu define the text style. The entries are the same as for point and line layers.

The *Formatting* menu allows you to format multiple lines like for point and line layers.

As with point and line layers you can create a text buffer in the *Buffer* menu.

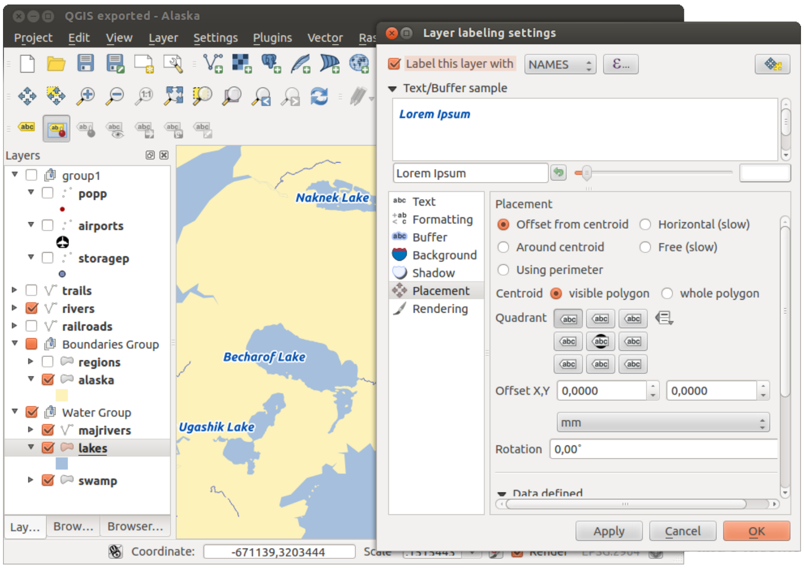
Use the *Background* menu to create a complex user-defined background for the polygon layer. You can use the menu as well as for the point and line layers.

The entries in the *Shadow* menu are the same as for point and line layers.

In the *Placement* menu you find special settings for polygon layers (see Figure_labels_3). ● *Offset from centroid*, ○ *Horizontal (slow)*, ○ *Around centroid*, ○ *Free* and ○ *Using perimeter* are possible.

In the ● *Offset from centroid* settings you can define if the centroid is ● *visible polygon* or ○ *whole polygon*. That means that either the centroid is used for the polygon you can see on the map or the centroid is used for the whole polygon, no matter if you can see the whole feature on the map. You can place your label with the quadrants here and define offset and rotation. The ○ *Around centroid* setting makes it possible to place the label around the centroid with a certain distance. Again, you can define ● *visible polygon* or ○ *whole polygon* for the centroid. With the ○ *Using perimeter* settings you can define a position and a distance for the label. For the position ☑ *Above line*, ☑ *On line*, ☑ *Below line* and ☑ *Line orientation dependend position* are possible.

The entries in the *Rendering* menu are the same as for line layers. You can also use *Suppress labeling of features smaller than* in the *Feature options*.


QGIS exported - Alaska
Project
Edit
View
Layer
Settings
Plugins
Vector
Layers
group1
popp
airports
storagep
trails
rivers
railroads
Boundaries Group
regions
alaska
Water Group
majrivers
lakes
swamp
Naknek Lake
Becharof Lake
Ugashik Lake
Lay...
Brow...
Browser...
Coordinate:
-671139,3203444
Layer labeling settings
Label this layer with
NAMES
Text/Buffer sample
Lorem Ipsum
Lorem Ipsum
Text
Formatting
Buffer
Background
Shadow
Placement
Rendering
Placement
Offset from centroid
Horizontal (slow)
Around centroid
Free (slow)
Using perimeter
Centroid
visible polygon
whole polygon
Quadrant
Offset X,Y
0,0000
0,0000
mm
Rotation
0,00°
Data defined
Apply
Cancel
OK

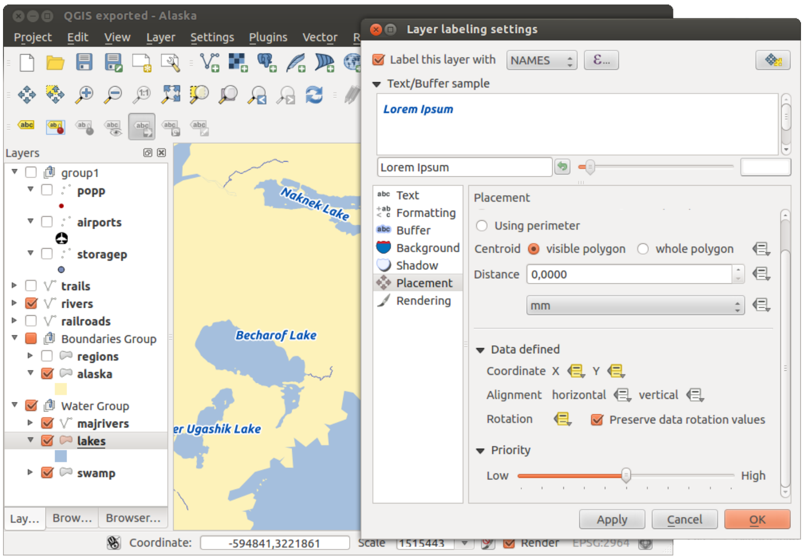
Gambar 12.16: Smart labeling of vector polygon layers

Using data-defined override for labeling

With the data-defined override functions the settings for the labeling are overwritten by entries in the attribute table. You can activate/deactivate the function with the right-mouse button. Hover over the symbol and you see the information about the data-defined override, including the current definition field. We now describe an example how to use the data-defined override function for the Move label function (see figure_labels_4).

1. Import the lakes.shp from the QGIS sample dataset.
2. Double-klick the layer to open the Layer Properties. Klick on *Labels* and *Placement*. Select ● *Offset from centroid*.
3. Look for the *Data defined* entries. Klick the -Icon to define the field type for the *Coordinate*. Choose 'xlabel' for X and 'ylabel' for Y. The Icons are now highlighted in yellow.
4. Zoom into a lake.

5. Go to the Label toolbar and klick the Icon. Now you can shift the label manually to another position (see figure_labels_5). The new position of the label is saved in the 'xlabel' and 'ylabel' columns of the attribute table.


QGIS exported - Alaska
Project
Edit
View
Layer
Settings
Plugins
Vector
Layers
group1
popp
airports
storagep
trails
rivers
railroads
Boundaries Group
regions
alaska
Water Group
majrivers
lakes
swamp
Lay...
Brow...
Browser...
Naknek Lake
Becharof Lake
er Ugashik Lake
Layer labeling settings
Text/Buffer sample
Lorem Ipsum
Text
Formatting
Buffer
Background
Shadow
Placement
Rendering
Data defined
Priority
Low
High
Apply
Cancel
OK
Render
EPSG:2964

☑ Label this layer with NAMES

Placement

○ Using perimeter

Centroid ● visible polygon ○ whole polygon

Distance 0,0000

mm

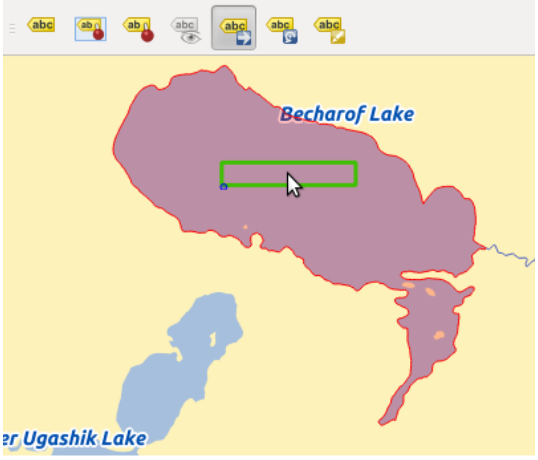
Coordinate X Y

Alignment horizontal vertical

Rotation ☑ Preserve data rotation values

Coordinate: -594841,3221861 Scale 1515443

Gambar 12.17: Labeling of vector polygon layers with data-defined override


Becharof Lake
er Ugashik Lake

Gambar 12.18: Move labels

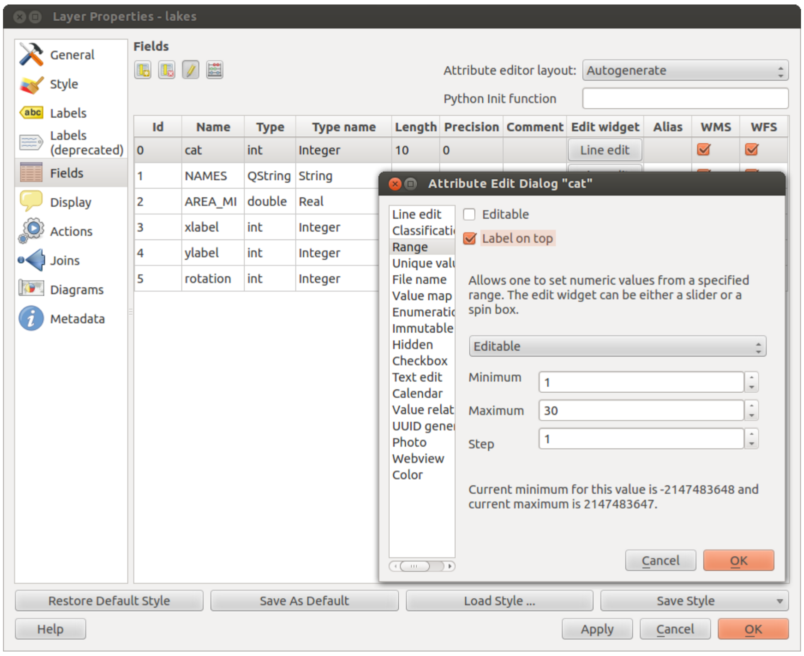
12.2.3 Fields Menu

Within the *Fields* menu the field attributes of the selected dataset can be manipulated. The buttons New Column and Delete Column can be used, when the dataset is Editing mode.

Edit Widget

Within the *Fields* menu you also find an **edit widget** column. This column can be used to define values or a range of values that are allowed to be added to the specific attribute table column. If you click on the **[edit widget]** button, a dialog opens, where you can define different widgets. These widgets are:

- **Line edit**: an edit field which allows to enter simple text (or restrict to numbers for numeric attributes).
- **Classification**: Displays a combo box with the values used for classification, if you have chosen 'unique value' as legend type in the *Style* menu of the properties dialog.


Layer Properties - lakes
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Fields
Attribute Edit Dialog "cat"
Line edit
Classificati
Range
Unique valu
File name
Value map
Enumeratic
Immutable
Hidden
Checkbox
Text edit
Calendar
Value relat
UUID gene
Photo
Webview
Color
Cancel
OK
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Attribute editor layout: Autogenerate

Python Init function

Id	Name	Type	Type name	Length	Precision	Comment	Edit widget	Alias	WMS	WFS
0	cat	int	Integer	10	0		Line edit		☑	☑
1	NAMES	QString	String							
2	AREA_MI	double	Real							
3	xlabel	int	Integer							
4	ylabel	int	Integer							
5	rotation	int	Integer							

☐ Editable

☑ Label on top

Allows one to set numeric values from a specified range. The edit widget can be either a slider or a spin box.

Editable

Minimum 1

Maximum 30

Step 1

Current minimum for this value is -2147483648 and current maximum is 2147483647.

Gambar 12.19: Dialog to select an edit widget for an attribute column 🐧

- **Range**: Allows to set numeric values from a specific range. The edit widget can be either a slider or a spin box.
- **Unique values**: The user can select one of the values already used in the attribute table. If editable is activated, a line edit is shown with autocompletion support, otherwise a combo box is used.
- **File name**: Simplifies the selection by adding a file chooser dialog.
- **Value map**: a combo box with predefined items. The value is stored in the attribute, the description is shown in the combo box. You can define values manually or load them from a layer or a CSV file.
- **Enumeration**: Opens a combo box with values that can be used within the columns type. This is currently only supported by the postgres provider.
- **Immutable**: The immutable attribute column is read-only. The user is not able to modify the content.
- **Hidden**: A hidden attribute column is invisible. The user is not able to see its content.
- **Checkbox**: Displays a checkbox and you can define what attribute is added to the column when the checkbox is activated or not.
- **Text edit**: This opens a text edit field that allows multiple lines to be used.
- **Calendar**: Opens a calendar widget to enter a date. Column type must be text.
- **Value Relation**: Offers values from a related table in a combobox. You can select layer, key column and value column.
- **UUID Generator**: Generates a read-only UUID (Universally Unique Identifiers) field, if empty.
- **Photo**: Field contains a filename for a picture. The width and height of the field can be defined.
- **Webview**: Field contains an URL. The width and height of the field is variable.
- **Color**: A field which allows to enter color codes. During data entry the color is visible through a color bar included in the field.

With the **Attribute editor layout** you can now define builtin forms for data entry jobs (see figure_fields_2). Choose ‘Drag and drop designer’ and an attribute column. Use the ✚ Icon to create a category that then will be shown during the digitizing session (see figure_fields_3). Next step will be to assign the relevant fields to the category with the ▷ Icon. You can create more categories and use the same fields again. When creating a new category QGIS will insert a new tab for the category in the built in form.

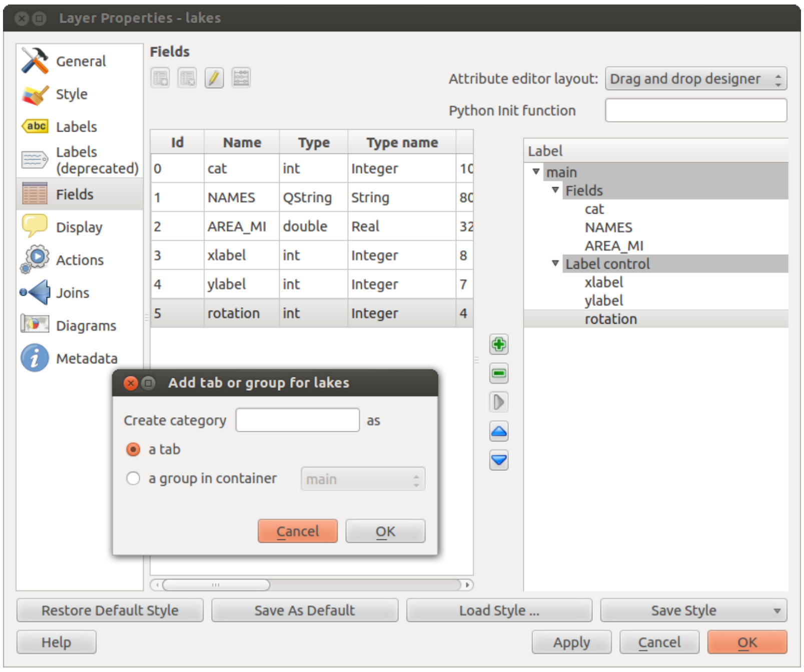
Other options in the dialog are 'Autogenerate' and 'Provide ui-file'. 'Autogenerate' just creates Editors for all fields and tabulates them. The 'Provide ui-file' option allows you to use complex dialogs made with the Qt-Designer. Using an UI-file allows a large freedom in creating a dialog. For detailed information see http://nathanw.net/2011/09/05/qgis-tips-custom-feature-forms-with-python-logic/ .

QGIS dialogs can have a python function that is called when the dialog is opened. Use this function to add extra logic to your dialogs. An example is (in module MyForms.py):

```
def open(dialog,layer,feature):
geom = feature.geometry()
control = dialog.findChild(QWidged,"My line edit")
```

Reference in Python Init Function like so: MyForms.open

MyForms.py must live on PYTHONPATH, .qgis2/python, or inside the project folder


Layer Properties - lakes
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Fields
Add tab or group for lakes
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Attribute editor layout: Drag and drop designer

Python Init function

Id	Name	Type	Type name	
0	cat	int	Integer	10
1	NAMES	QString	String	80
2	AREA_MI	double	Real	32
3	xlabel	int	Integer	8
4	ylabel	int	Integer	7
5	rotation	int	Integer	4

Label
- main
  - Fields
    - cat
    - NAMES
    - AREA_MI
  - Label control
    - xlabel
    - ylabel
    - rotation

Create category ☐ as

● a tab

○ a group in container main

Cancel OK

Gambar 12.20: Dialog to create categories with the **Attribute editor layout**

12.2.4 General Menu

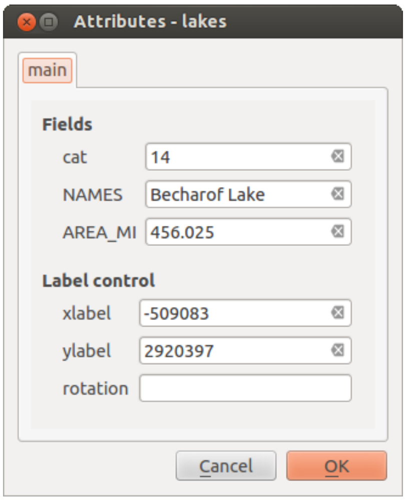
Use this menu to make general settings for the vector layer. There are several options available:

Layer Info

- Change the display name of the layer in *displayed as*
- Define the *Layer source* of the vector layer
- Define the *Data source encoding* to define provider specific option and to be able to read the file

Coordinate Reference System

- *Specify* the Coordinate Reference System. Here you can view or change the projection of the specific vector layer.
- Create a *Spatial Index* (only for OGR supported formats)


Attributes - lakes
main
Cancel
OK

Fields

cat: 14

NAMES: Becharof Lake

AREA_MI: 456.025

Label control

xlabel: -509083

ylabel: 2920397

rotation:

Gambar 12.21: Resulting built in form in a data entry session

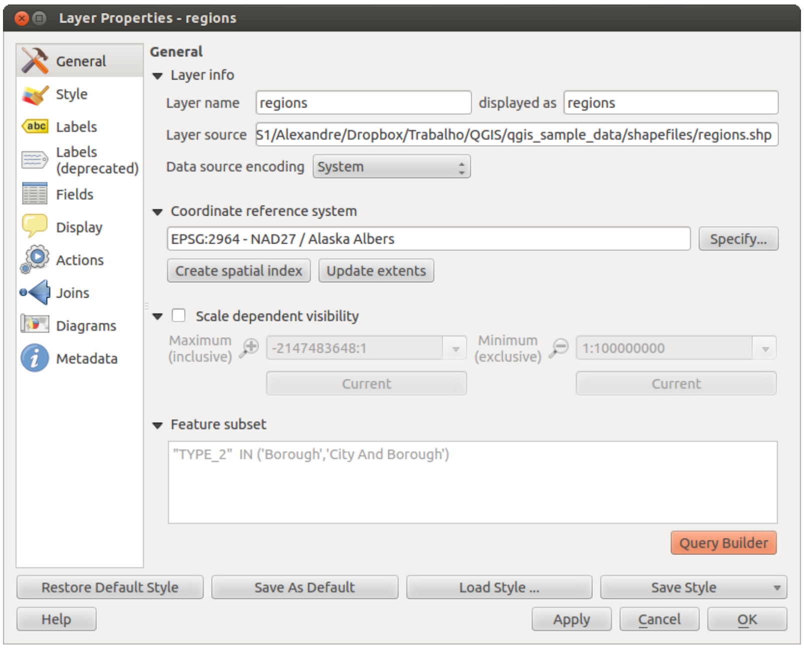
- *Update Extents* information for a layer
- View or change the projection of the specific vector layer, clicking on *Specify* ...

☑ *Scale dependent visibility*

- You can set the *Maximum (inclusive)* and *Minimum (exclusive)* scale. The scale can also be set by the **[Current]** buttons

Feature subset

- With the **[Query Builder]** button you can create a subset of the features in the layer that will be visualized (also refer to section *Save selected features as new layer*).


Layer Properties - regions
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Specify...
Create spatial index
Update extents
Current
Current
Query Builder
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

General

Layer info

Layer name: regions — displayed as: regions

Layer source: S1/Alexandre/Dropbox/Trabalho/QGIS/qgis_sample_data/shapefiles/regions.shp

Data source encoding: System

Coordinate reference system: EPSG:2964 - NAD27 / Alaska Albers

☐ Scale dependent visibility

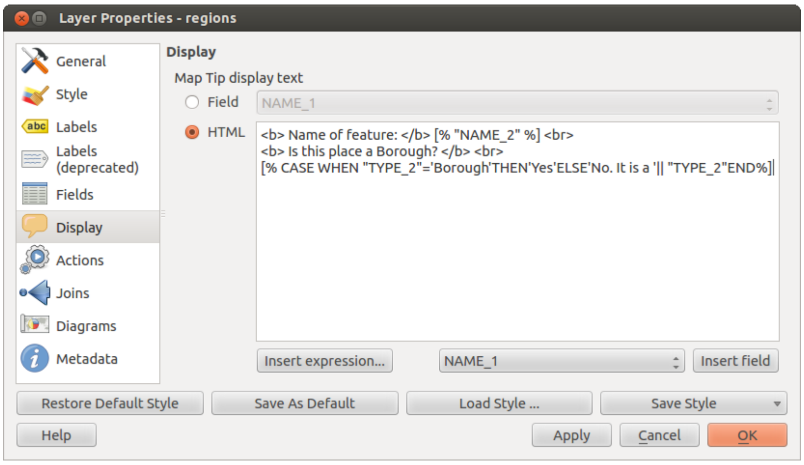
Maximum (inclusive): -2147483648:1 — Minimum (exclusive): 1:100000000

Feature subset: "TYPE_2" IN ('Borough','City And Borough')

Gambar 12.22: General menu in vector layers properties dialog

12.2.5 Display Menu

In QGIS 2.0 there is now an own menu for the map tips. It includes a new feature: Map Tip display text in HTML. While you can still choose a ○ *Field* to be displayed when hovering over a feature on the map it is now possible to insert HTML code that creates a complex display when hovering over a feature. To activate Map Tips, select the menu option *View* → *MapTips*.Figure Display 1 shows an example of HTML code.


Layer Properties - regions
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Insert expression...
Insert field
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Display

Map Tip display text

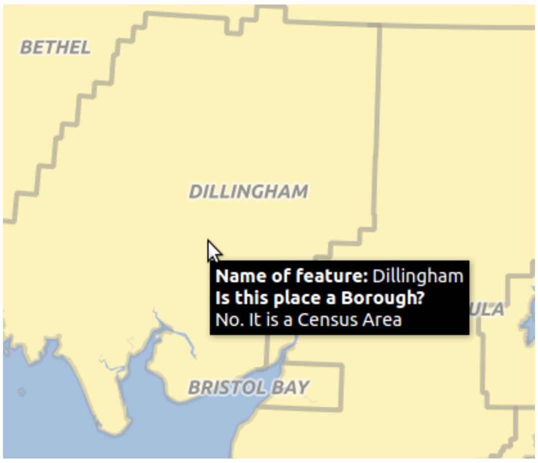
○ Field NAME_1

● HTML

```
<b> Name of feature: </b> [% "NAME_2" %] <br>
<b> Is this place a Borough? </b> <br>
[% CASE WHEN "TYPE_2"='Borough'THEN'Yes'ELSE'No. It is a '|| "TYPE_2"END%]
```

NAME_1

Gambar 12.23: HTML code for map tip


BETHEL
DILLINGHAM
ULA
BRISTOL BAY
Name of feature: Dillingham
Is this place a Borough?
No. It is a Census Area

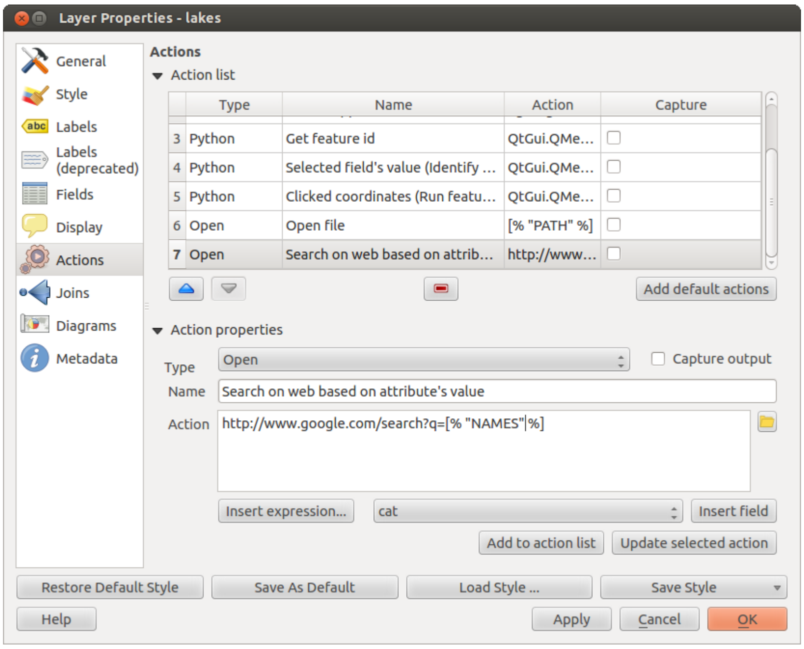
Gambar 12.24: Map tip made with HTML code

12.2.6 Actions Menu

QGIS provides the ability to perform an action based on the attributes of a feature. This can be used to perform any number of actions, for example, running a program with arguments built from the attributes of a feature or passing parameters to a web reporting tool.

Actions are useful when you frequently want to run an external application or view a web page based on one or more values in your vector layer. They are devided into 6 types and can be used like this:

- Generic, Mac, Windows and Unix actions start an external process,
- Python actions execute a python expression,
- Generic and Python actions are visible everywhere,



	Type	Name	Action	Capture
3	Python	Get feature id	QtGui.QMe...	☐
4	Python	Selected field's value (Identify ...	QtGui.QMe...	☐
5	Python	Clicked coordinates (Run featu...	QtGui.QMe...	☐
6	Open	Open file	[% "PATH" %]	☐
7	Open	Search on web based on attrib...	http://www...	☐

Type: Open

☐ Capture output

Name: Search on web based on attribute's value

Action: http://www.google.com/search?q=[% "NAMES"%]

cat

Gambar 12.25: Overview action dialog with some sample actions

- Mac, Windows and Unix actions are visible only on the respective platform (i.e. you can define three 'Edit' actions to open an editor and the users can only see and execute the one 'Edit' action for their platform to run the editor).

There are several examples included in the dialog. You can load them clicking on **[Add default actions]**. An example is performing a search based on an attribute value. This concept is used in the following discussion.

Defining Actions

Attribute actions are defined from the vector *Layer Properties* dialog. To define an action, open the vector *Layer Properties* dialog and click on the *Actions* menu. Go to the *Action properties*. Select 'Generic' as type and provide a descriptive name for the action. The action itself must contain the name of the application that will be executed when the action is invoked. You can add one or more attribute field values as arguments to the application. When the action is invoked any set of characters that start with a `%` followed by the name of a field will be replaced by the value of that field. The special characters %% will be replaced by the value of the field that was selected from the identify results or attribute table (see using_actions below). Double quote marks can be used to group text into a single argument to the program, script or command. Double quotes will be ignored if preceded by a backslash.

If you have field names that are substrings of other field names (e.g., `col1` and `col10`) you should indicate so, by surrounding the field name (and the % character) with square brackets (e.g., `[%col10]`). This will prevent the `%col10` field name being mistaken for the `%col1` field name with a `0` on the end. The brackets will be removed by QGIS when it substitutes in the value of the field. If you want the substituted field to be surrounded by square brackets, use a second set like this: `[[%col10]]`.

Using the *Identify Features* tool you can open *Identify Results* dialog. It includes a *(Derived)* item that contains information relevant to the layer type. The values in this item can be accessed in a similar way to the other fields by using preceeding the derived field name by `(Derived).`. For example, a point layer has an `X` and `Y` field and the value of these can be used in the action with `%(Derived).X` and `%(Derived).Y`. The derived attributes are only available from the *Identify Results* dialog box, not the *Attribute Table* dialog box.

Two example actions are shown below:

- `konqueror http://www.google.com/search?q=%nam`
- `konqueror http://www.google.com/search?q=%%`

In the first example, the web browser konqueror is invoked and passed a URL to open. The URL performs a Google search on the value of the `nam` field from our vector layer. Note that the application or script called by the action must be in the path or you must provide the full path. To be sure, we could rewrite the first example as: `/opt/kde3/bin/konqueror http://www.google.com/search?q=%nam`. This will ensure that the konqueror application will be executed when the action is invoked.

The second example uses the %% notation which does not rely on a particular field for its value. When the action is invoked, the %% will be replaced by the value of the selected field in the identify results or attribute table.
Using Actions

Actions can be invoked from either the *Identify Results* dialog, an *Attribute Table* dialog or from *Run Feature Action* (recall that these dialogs can be opened by clicking Identify Features or Open Attribute Table or Run Feature Action). To invoke an action, right click on the record and choose the action from the popup menu. Actions are listed in the popup menu by the name you assigned when defining the actions. Click on the action you wish to invoke.

If you are invoking an action that uses the `%%` notation, right-click on the field value in the *Identify Results* dialog or the *Attribute Table* dialog that you wish to pass to the application or script.

Here is another example that pulls data out of a vector layer and inserts them into a file using bash and the `echo` command (so it will only work or perhaps). The layer in question has fields for a species name `taxon_name`, latitude `lat` and longitude `long`. I would like to be able to make a spatial selection of a localities and export these field values to a text file for the selected record (shown in yellow in the QGIS map area). Here is the action to achieve this:

```
bash -c "echo \"%taxon_name %lat %long\" >> /tmp/species_localities.txt"
```

After selecting a few localities and running the action on each one, opening the output file will show something like this:

```
Acacia mearnsii -34.0800000000 150.0800000000
Acacia mearnsii -34.9000000000 150.1200000000
Acacia mearnsii -35.2200000000 149.9300000000
Acacia mearnsii -32.2700000000 150.4100000000
```

As an exercise we create an action that does a Google search on the `lakes` layer. First we need to determine the URL needed to perform a search on a keyword. This is easily done by just going to Google and doing a simple search, then grabbing the URL from the address bar in your browser. From this little effort we see that the format is: http://google.com/search?q=qgis, where `QGIS` is the search term. Armed with this information, we can proceed:

1. Make sure the `lakes` layer is loaded.
2. Open the *Layer Properties* dialog by double-clicking on the layer in the legend or right-click and choose *Properties* from the popup menu.
3. Click on the *Actions* menu.
4. Enter a name for the action, for example `Google Search`.
5. For the action, we need to provide the name of the external program to run. In this case, we can use Firefox. If the program is not in your path, you need to provide the full path.
6. Following the name of the external application, add the URL used for doing a Google search, up to but not included the search term: `http://google.com/search?q=`
7. The text in the *Action* field should now look like this: `firefox http://google.com/search?q=`
8. Click on the drop-down box containing the field names for the `lakes` layer. It's located just to the left of the **[Insert Field]** button.
9. From the drop-down box select 'NAMES' and click **[Insert Field]**.
10. Your action text now looks like this:

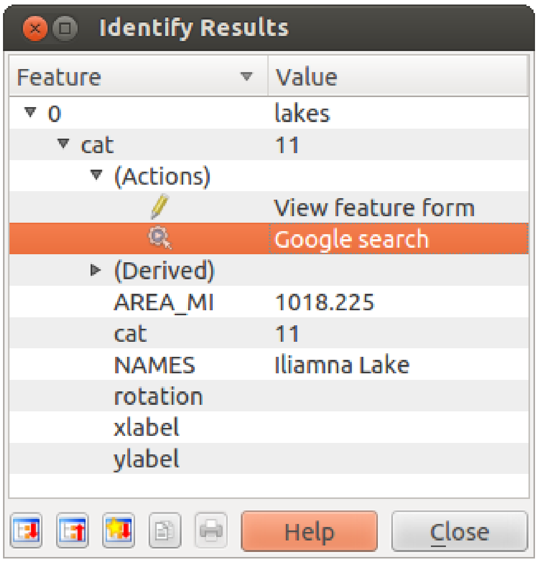
    ```
    firefox http://google.com/search?q=%NAMES
    ```

11. To finalize the action click the **[Add to action list]** button.

This completes the action and it is ready to use. The final text of the action should look like this:

```
firefox http://google.com/search?q=%NAMES
```

We can now use the action. Close the *Layer Properties* dialog and zoom in to an area of interest. Make sure the `lakes` layer is active and identify a lake. In the result box you'll now see that our action is visible:



Feature	Value
▼ 0	lakes
▼ cat	11
▼ (Actions)	
	View feature form
	Google search
▶ (Derived)	
AREA_MI	1018.225
cat	11
NAMES	Iliamna Lake
rotation	
xlabel	
ylabel	

Gambar 12.26: Select feature and choose action

When we click on the action, it brings up Firefox and navigates to the URL http://www.google.com/search?q=Tustumena. It is also possible to add further attribute fields to the action. Therefore you can add a + to the end of the action text, select another field and click on **[Insert Field]**. In this example there is just no other field available that would make sense to search for.

You can define multiple actions for a layer and each will show up in the *Identify Results* dialog.

You can think of all kinds of uses for actions. For example, if you have a point layer containing locations of images or photos along with a file name, you could create an action to launch a viewer to display the image. You could also use actions to launch web-based reports for an attribute field or combination of fields, specifying them in the same way we did in our Google search example.

We can also make more complex examples, for instance on how to use **Python** actions.

Usually when we create an action to open a file with an external application we can use absolute paths, or eventually relative paths, in the second case the path is relative to the location of the external program executable file. But what about we need to use relative paths, relative to the selected layer (a file based one, like a shapefile or spatialite)? The following code will do the trick:

```
command = "firefox";
imagerelpath = "images_test/test_image.jpg";
layer = qgis.utils.iface.activeLayer();
import os.path;
layerpath = layer.source() if layer.providerType() == ’ogr’ \
  else (qgis.core.QgsDataSourceURI(layer.source()).database() \
  if layer.providerType() == ’spatialite’ else None);
path = os.path.dirname(str(layerpath));
image = os.path.join(path,imagerelpath);
import subprocess;
subprocess.Popen( [command, image ] );
```

we have to just remember that the action is one of type *Python* and to change the *command* and *imagerelpath* variables to fit our needs.

But what about if the relative path need to be relative to the (saved) project file? The code of the Python action would be:

```
command="firefox";
imagerelpath="images/test_image.jpg";
projectpath=qgis.core.QgsProject.instance().fileName();
import os.path; path=os.path.dirname(str(projectpath)) if projectpath != '' else None;
image=os.path.join(path, imagerelpath);
import subprocess;
subprocess.Popen( [command, image ] );
```

Another Python actions example if the one that allows us to add new layers to the project. For instance the following examples will add to the project respectively a vector and a raster. The name of files to be added to the project and the name to be given to the layer are data driven (*filename* and *layname* are column names of the table of attributes of the vector where the action was created):

```
qgis.utils.iface.addVectorLayer('/yourpath/[% "filename" %].shp','[% "layername" %]',\
  'ogr')
```

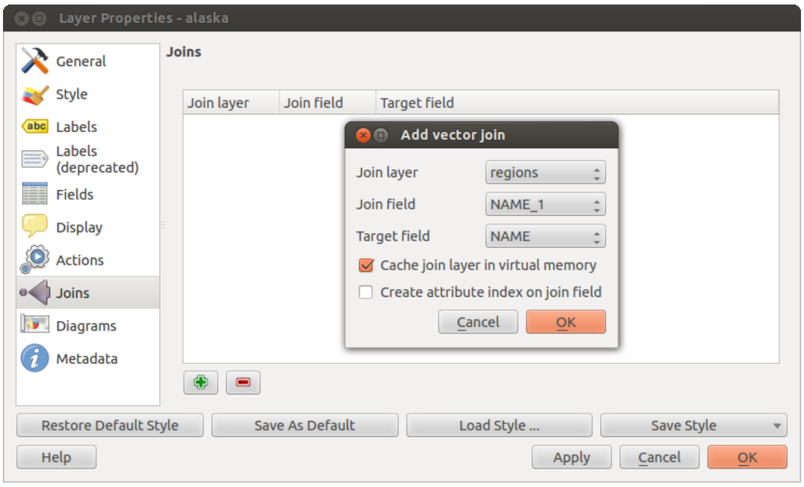
To add a raster (a tif image in this example) it becomes:

```
qgis.utils.iface.addRasterLayer('/yourpath/[% "filename" %].tif','[% "layername" %]')
```

12.2.7 Joins Menu

The *Joins* menu allows you to join a loaded attribute table to a loaded vector layer. After clicking ➕ the *Add vector join* dialog appears. As key columns you have to define a join layer you want to connect with the target vector layer , a join field that corresponds to an attribute column in the target layer and a target field you find in the attribute table of the target vector layer here. As a result, all information of the join layer and the target layer are displayed in the attribute table of the target layer as joined information.

QGIS currently supports to join non spatial table formats supported by OGR (e.g. CSV, DBF and Excel), delimited text and the PostgreSQL provider (see figure_joins_1).



Join layer: regions
Join field: NAME_1
Target field: NAME
☑ Cache join layer in virtual memory
☐ Create attribute index on join field

Layer Properties - alaska
General
Style
Labels
Labels (deprecated)
Fields
Display
Actions
Joins
Diagrams
Metadata
Joins
Join layer
Join field
Target field
Add vector join
Cancel
OK
Restore Default Style
Save As Default
Load Style ...
Save Style
Help
Apply
Cancel
OK

Gambar 12.27: Join an attribute table to an existing vector layer

Additionally the add vector join dialog allows to:

- ☑ *Cache join layer in virtual memory*
- ☑ *Create attribute index on the join field*

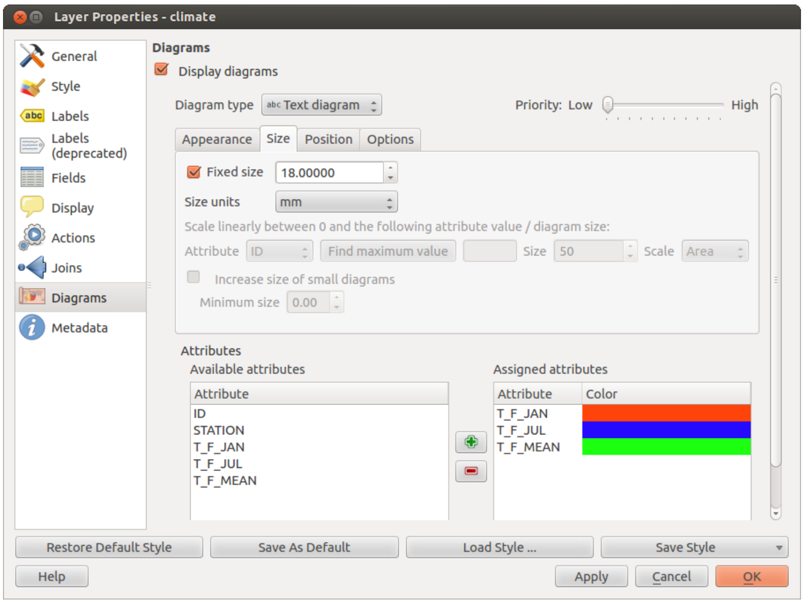
12.2.8 Diagrams Menu

The *Diagrams* menu allows you to add a graphic overlay to a vector layer (see figure_diagrams_1).

The current core implementation of diagrams provides support for piecharts, text diagrams and histograms.

The menu is divided into four tabs now: *Appearance*, *Size*, *Postion* and *Options*.

In the case of the text diagram and piechart text values of different data columns are displayed one below the other with a circle or a box and dividers. In the *Size* tab diagram size is based on a fixed size or on linear scaling according to a classification attribute. The placement of the diagrams which is done in the *Position* tab interacts with the new labeling, so position conflicts between diagrams and labels are detected and solved. In addition to chart positions can be fixed by the users hand.



☑ Display diagrams

Diagram type: Text diagram

Priority: Low — High

☑ Fixed size: 18.00000

Size units: mm

Scale linearly between 0 and the following attribute value / diagram size:

Attribute: ID | Find maximum value | Size: 50 | Scale: Area

☐ Increase size of small diagrams

Minimum size: 0.00

Attributes

Available attributes
Attribute
ID
STATION
T_F_JAN
T_F_JUL
T_F_MEAN

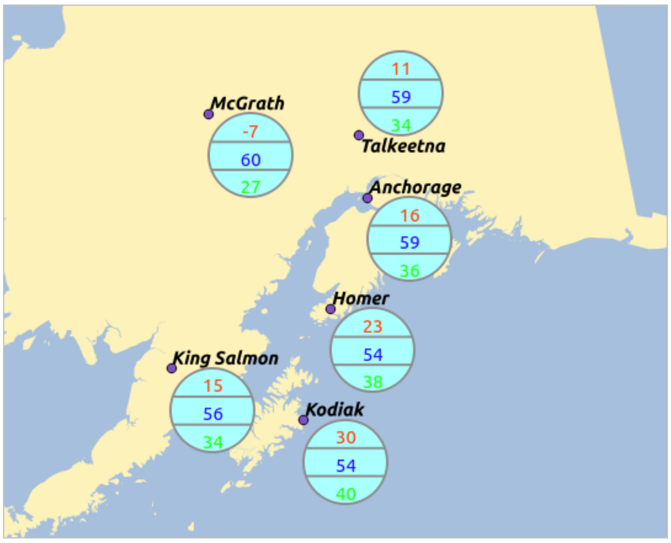
Assigned attributes	
Attribute	Color
T_F_JAN	🟥
T_F_JUL	🟦
T_F_MEAN	🟩

Gambar 12.28: Vector properties dialog with diagram menu

We will demonstrate an example and overlay the alaska boundary layer a text diagram showing some temperature data from a climate vector layer. Both vector layers are part of the QGIS sample dataset (see Section *Contoh data*).

1. First click on the Load Vector icon, browse to the QGIS sample dataset folder and load the two vector shape layers `alaska.shp` and `climate.shp`.
2. Double click the `climate` layer in the map legend to open the *Layer Properties* dialog.
3. Click on the *Diagrams* menu, activate ☑ *Display diagrams* and from *Diagram type* combobox select 'Text diagram'
4. In the *Appearance* tab we choose a light blue as Background color and in the *Size* tab we set a fixed size to 18 mm.
5. In the *Position* tab Placement could be set to AroundPoint.
6. In the diagram we want to display the values of the three columns `T_F_JAN`, `T_F_JUL` and `T_F_MEAN`. First select `T_F_JAN` as *Attributes* and click the ✚ button, then `T_F_JUL` and finally `T_F_MEAN`.
7. Now click **[Apply]** to display the diagram in the QGIS main window.
8. You can now adapt the chart size in the *Size* tab. Deactivate the ☑ *Fixed size* and set the size of the diagrams on the basis of an Attribute with the **[Find maximum value]** button and the *Size* menu. If diagrams appear too small on the screen you can activate the ☑ *Increase size of small diagrams* checkbox and define the Minimum size of the diagrams.

9. Change the Attribute Colors by double clicking on the color values in the *Assigned attributes* field. Figure_diagrams_2 gives an impression.
10. Finally click **[Ok]**.



Gambar 12.29: Diagram from temperature data overlayed on a map

Remember that in the *Position* tab a ☑ *Data defined position* of the diagrams is possible. Here you can use attributes to define the position of the diagram. Also, a scale dependent visibility that you can find in the *Appearance* tab is possible.

12.2.9 Metadata Menu

The *Metadata* menu consists of a *Description*, *Attribution*, *MetadataURL* and *Properties* section.

In the *Properties* section you get general information about the layer, including specifics about the type and location, number of features, feature type, and the editing capabilities in the *Properties* section. The *Extents* table provides you with layer extent information, and the *Layer Spatial Reference System* information, providing information about the CRS of the layer. This is a quick way to get information about the layer.

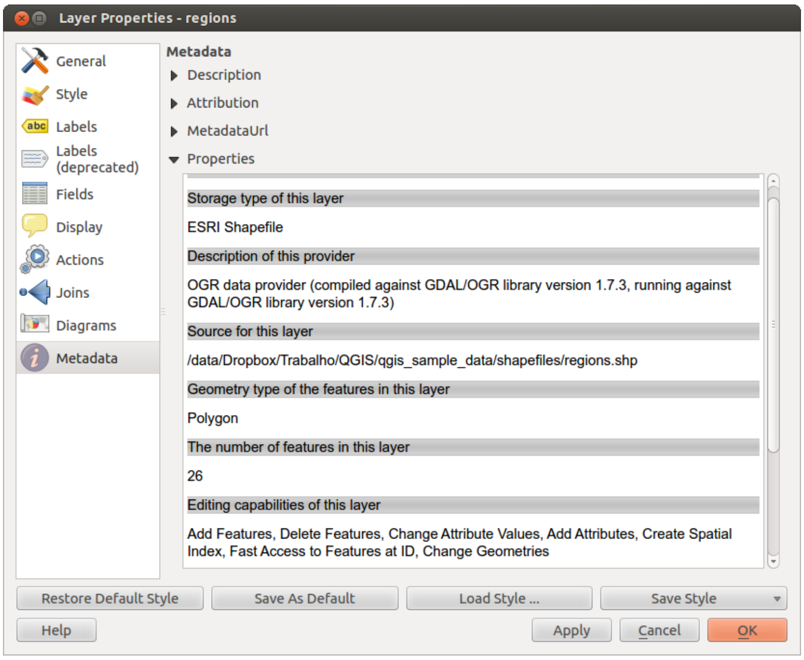
Additionally you can add/edit a title for the layer and some abstract information in the *Description*. Also, it's possible to define a *Keyword list* here. These keyword lists can be used in a metadata catalogue. If you want to use a title from an XML metadata file you have to fill in a link in the *DataUrl* field. Use *Attribution* to get Atrribute data from an XML metadata catalogue. In *MetadataUrl* you can define the general path to the XML metadata catalogue. These information will be saved in the QGIS project file for following sessions and will be used for QGIS server.

12.3 Editing

QGIS supports various capabilities for editing OGR, SpatiaLite, PostGIS, MSSQL Spatial and Oracle Spatial vector layers and tables.

Catatan: The procedure for editing GRASS layers is different - see Section *Digitizing and editing a GRASS vector layer* for details.

Tip: Concurrent Edits



Storage type of this layer

ESRI Shapefile

Description of this provider

OGR data provider (compiled against GDAL/OGR library version 1.7.3, running against GDAL/OGR library version 1.7.3)

Source for this layer

/data/Dropbox/Trabalho/QGIS/qgis_sample_data/shapefiles/regions.shp

Geometry type of the features in this layer

Polygon

The number of features in this layer

26

Editing capabilities of this layer

Add Features, Delete Features, Change Attribute Values, Add Attributes, Create Spatial Index, Fast Access to Features at ID, Change Geometries

Gambar 12.30: Metadata menu in vector layers properties dialog

This version of QGIS does not track if somebody else is editing a feature at the same time as you. The last person to save their edits wins.

12.3.1 Setting the Snapping Tolerance and Search Radius

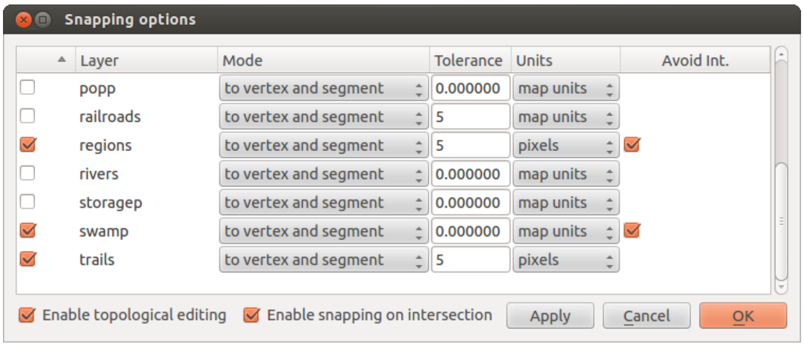
Before we can edit vertices, we must set the snapping tolerance and search radius to a value that allows us an optimal editing of the vector layer geometries.

Snapping tolerance

Snapping tolerance is the distance QGIS uses to `search` for the closest vertex and/or segment you are trying to connect when you set a new vertex or move an existing vertex. If you aren't within the snapping tolerance, QGIS will leave the vertex where you release the mouse button, instead of snapping it to an existing vertex and/or segment. The snapping tolerance setting affects all tools which work with tolerance.

1. A general, project wide snapping tolerance can be defined choosing *Settings* → *Options*. On Mac: go to *QIS* → *Preferences...*, on Linux: *Edit* → *Options*. In the *Digitizing* tab you can select between to vertex, to segment or to vertex and segment as default snap mode. You can also define a default snapping tolerance and a search radius for vertex edits. The tolerance can be set either in map units or in pixels. The advantage of choosing pixels, is that the snapping tolerance doesn't have to be changed after zoom operations. In our small digitizing project (working with the Alaska dataset), we define the snapping units in feet. Your results may vary, but something on the order of 300ft should be fine at a scale of 1:10 000 should be a reasonable setting.
2. A layer based snapping tolerance can be defined by choosing *Settings* → (or *File* →) *Snapping options...* to enable and adjust snapping mode and tolerance on a layer basis (see figure_edit_1).

Note that this layer based snapping overrides the global snapping option set in the Digitizing tab. So if you need to edit one layer, and snap its vertices to another layer, then enable snapping only on the `snap to` layer, then decrease the global snapping tolerance to a smaller value. Furthermore, snapping will never occur to a layer which is not checked in the snapping options dialog, regardless of the global snapping tolerance. So be sure to mark the checkbox for those layers that you need to snap to.



	Layer	Mode	Tolerance	Units	Avoid Int.
☐	popp	to vertex and segment	0.000000	map units	
☐	railroads	to vertex and segment	5	map units	
☑	regions	to vertex and segment	5	pixels	☑
☐	rivers	to vertex and segment	0.000000	map units	
☐	storagep	to vertex and segment	0.000000	map units	
☑	swamp	to vertex and segment	0.000000	map units	☑
☑	trails	to vertex and segment	5	pixels	

☑ Enable topological editing ☑ Enable snapping on intersection

Gambar 12.31: Edit snapping options on a layer basis

Search radius

Search radius is the distance QGIS uses to `search` for the closest vertex you are trying to move when you click on the map. If you aren't within the search radius, QGIS won't find and select any vertex for editing and it will pop up an annoying warning to that effect. Snap tolerance and search radius are set in map units or pixels, so you may find you need to experiment to get them set right. If you specify too big of a tolerance, QGIS may snap to the wrong vertex, especially if you are dealing with a large number of vertices in close proximity. Set search radius too small and it won't find anything to move.

The search radius for vertex edits in layer units can be defined in the *Digitizing* tab under *Settings* → *Options*. The same place where you define the general, project wide snapping tolerance.

12.3.2 Zooming and Panning

Before editing a layer, you should zoom in to your area of interest. This avoids waiting while all the vertex markers are rendered across the entire layer.

Apart from using the pan and zoom-in / zoom-out icons on the toolbar with the mouse, navigating can also be done with the mouse wheel, spacebar and the arrow keys.

Zooming and panning with the mouse wheel

While digitizing you can press the mouse wheel to pan inside of the main window and you can roll the mouse wheel to zoom in and out on the map. For zooming place the mouse cursor inside the map area and roll it forward (away from you) to zoom in and backwards (towards you) to zoom out. The mouse cursor position will be the center of the zoomed area of interest. You can customize the behavior of the mouse wheel zoom using the *Map tools* tab under the *Settings* → *Options* menu.

Panning with the arrow keys

Panning the map during digitizing is possible with the arrow keys. Place the mouse cursor inside the map area and click on the right arrow key to pan east, left arrow key to pan west, up arrow key to pan north and down arrow key to pan south.

You can also use the spacebar to temporarily cause mouse movements to pan then map. The `PgUp` and `PgDown` keys on your keyboard will cause the map display to zoom in or out without interrupting your digitizing session.

12.3.3 Topological editing

Besides layer based snapping options you can also define some topological functionalities in the *Snapping options...* dialog in the *Settings* (or *File*) menu. Here you can define ☑ *Enable topological editing* and/or for polygon layers you can activate the column ☑ *Avoid Int.* which avoids intersection of new polygons.

Enable topological editing

The option ☑ *Enable topological editing* is for editing and maintaining common boundaries in polygon mosaics. QGIS 'detects' a shared boundary in a polygon mosaic and you only have to move the vertex once and QGIS will take care about updating the other boundary.

Avoid intersections of new polygons

The second topological option in the ☑ *Avoid Int.* column, called *Avoid intersections of new polygons* avoids overlaps in polygon mosaics. It is for quicker digitizing of adjacent polygons. If you already have one polygon, it is possible with this option to digitize the second one such that both intersect and QGIS then cuts the second polygon to the common boundary. The advantage is that users don't have to digitize all vertices of the common boundary.

Enable snapping on intersections

Another option is to use ☑ *Enable snapping on intersection*. It allows to snap on an intersection of background layers, even if there's no vertex on the intersection.

12.3.4 Digitizing an existing layer

By default, QGIS loads layers read-only: This is a safeguard to avoid accidentally editing a layer if there is a slip of the mouse. However, you can choose to edit any layer as long as the data provider supports it, and the underlying data source is writable (i.e. its files are not read-only).

In general, editing vector layers is divided into a digitizing and an advanced digitizing toolbar, described in Section *Advanced digitizing*. You can select and unselect both under *Settings* → *Toolbars* →. Using the basic digitizing tools you can perform the following functions:

Icon	Purpose	Icon	Purpose
✏	Current edits	✏	Toggle editing
	Adding Features: Capture Point		Adding Features: Capture Line
	Adding Features: Capture Polygon		Move Feature
	Node Tool		Delete Selected
✂	Cut Features	📄	Copy Features
📋	Paste Features	💾	Save layer edits

Table Editing: Vector layer basic editing toolbar

All editing sessions start by choosing the ✏ Toggle editing option. This can be found in the context menu after right clicking on the legend entry for that layer.

Alternately, you can use the Toggle Editing ✏ Toggle editing button from the digitizing toolbar to start or stop the editing mode. Once the layer is in edit mode, markers will appear at the vertices, and additional tool buttons on the editing toolbar will become available.

Tip: Save Regularly

Remember to 💾 Save Layer Edits regularly. This will also check that your data source can accept all the changes.

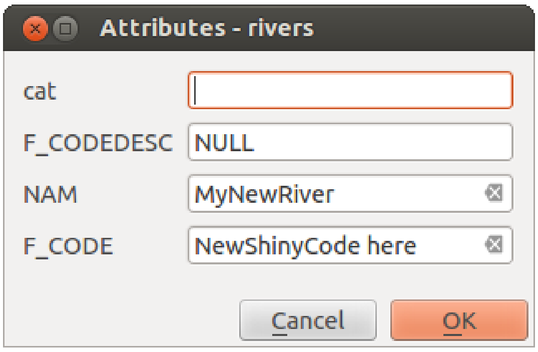
Adding Features

You can use the Add Feature, Add Feature or Add Feature icons on the toolbar to put the QGIS cursor into digitizing mode.

For each feature, you first digitize the geometry, then enter its attributes. To digitize the geometry, left-click on the map area to create the first point of your new feature.

For lines and polygons, keep on left-clicking for each additional point you wish to capture. When you have finished adding points, right-click anywhere on the map area to confirm you have finished entering the geometry of that feature.

The attribute window will appear, allowing you to enter the information for the new feature. Figure_edit_2 shows setting attributes for a fictitious new river in Alaska. In the *Digitizing* menu under the *Settings* → *Options* menu, you can also activate ☑ *Suppress attributes pop-up windows after each created feature* ☑ *Reuse last entered attribute values*.



Attributes - rivers

cat:

F_CODEDESC: NULL

NAM: MyNewRiver

F_CODE: NewShinyCode here

Gambar 12.32: Enter Attribute Values Dialog after digitizing a new vector feature

With the Move Feature(s) icon on the toolbar you can move existing features.

Tip: Attribute Value Types

For editing the attribute types are validated during the entry. Because of this, it is not possible to enter a number into the text-column in the dialog *Enter Attribute Values* or vice versa. If you need to do so, you should edit the attributes in a second step within the *Attribute table* dialog.

Current Edits

This new feature allows the digitization of multiple layers. Choose *Save for Selected Layers* to save all changes you made in multiple layers. You also have the opportunity to *Rollback for Selected Layers* so that the digitization is then withdrawn for all selected layers. If you want to stop editing the selected layers the *Cancel for Selected Layer(s)* is an easy way.

The same functions for editing all layers of the project are available.

Node Tool

For shapefile-based layers as well as SpatialLite,PostgreSQL/PostGIS, MSSQL Spatial and Oracle Spatial tables the Node Tool provides manipulation capabilites of feature vertices similar to CAD programs. It is possible to simply select multiple vertices at once and to move, add or delete them alltogether. The node tool also works with 'on the fly' projection turned on and supports the topological editing feature. This tool is, unlike other tools in

QGIS, persistent, so when some operation is done, selection stays active for this feature and tool. If the node tool couldn't find any features, a warning will be displayed.

Important is to set the property *Settings* → *Options* → *Digitizing* → *Search Radius:* 1,00 to a number greater than zero (i.e. 10). Otherwise QGIS will not be able to tell which vertex is being edited.

Tip: Vertex Markers

The current version of QGIS supports three kinds of vertex-markers: Semi transparent circle, Cross and None. To change the marker style, choose *Options* from the *Settings* menu and click on the *Digitizing* tab and select the appropriate entry.

Basic operations

Start by activating the Node Tool and selecting a feature by clicking on it. Red boxes will appear at each vertex of this feature.

- **Selecting vertices**: You can select vertices by clicking on them one at a time, by clicking on an edge to select the vertices at both ends, or by clicking and dragging a rectangle around some vertices. When a vertex is selected its color changes to blue. To add more vertices to the current selection, hold down the `Ctrl` key while clicking. Hold down `Ctrl` or `Shift` when clicking to toggle the selection state of vertices (vertices that are currently unselected will be selected as usual, but also vertices that are already selected will become unselected).
- **Adding vertices**: To add a vertex simply double click near an edge and a new vertex will appear on the edge near to the cursor. Note that the vertex will appear on the edge, not at the cursor position, therefore it has to be moved if necessary.
- **Deleting vertices**: After selecting vertices for deletion, click the `Delete` key. Note that you cannot use the Node Tool to delete a complete feature; QGIS will ensure it retains the minimum number of vertices for the feature type you are working on. To delete a complete feature use the Delete Selected tool.
- **Moving vertices**: Select all the vertices you want to move. Click on a selected vertex or edge and drag in the direction you wish to move. All the selected vertices will move together. If snapping is enabled, the whole selection can jump to the nearest vertex or line.

Each change made with the node tool is stored as a separate entry in the undo dialog. Remember that all operations support topological editing when this is turned on. On the fly projection is also supported, and the node tool provides tooltips to identify a vertex by hovering the pointer over it.

Cutting, Copying and Pasting Features

Selected features can be cut, copied and pasted between layers in the same QGIS project, as long as destination layers are set to Toggle editing beforehand.

Features can also be pasted to external applications as text: That is, the features are represented in CSV format with the geometry data appearing in the OGC Well-Known Text (WKT) format.

However in this version of QGIS, text features from outside QGIS cannot be pasted to a layer within QGIS. When would the copy and paste function come in handy? Well, it turns out that you can edit more than one layer at a time and copy/paste features between layers. Why would we want to do this? Say we need to do some work on a new layer but only need one or two lakes, not the 5,000 on our `big_lakes` layer. We can create a new layer and use copy/paste to plop the needed lakes into it.

As an example we are copying some lakes to a new layer:

1. Load the layer you want to copy from (source layer)
2. Load or create the layer you want to copy to (target layer)

3. Start editing for target layer
4. Make the source layer active by clicking on it in the legend
5. Use the Select Single Feature tool to select the feature(s) on the source layer
6. Click on the Copy Features tool
7. Make the destination layer active by clicking on it in the legend
8. Click on the Paste Features tool
9. Stop editing and save the changes

What happens if the source and target layers have different schemas (field names and types are not the same)? QGIS populates what matches and ignores the rest. If you don't care about the attributes being copied to the target layer, it doesn't matter how you design the fields and data types. If you want to make sure everything - feature and its attributes - gets copied, make sure the schemas match.

Tip: Congruency of Pasted Features

If your source and destination layers use the same projection, then the pasted features will have geometry identical to the source layer. However if the destination layer is a different projection then QGIS cannot guarantee the geometry is identical. This is simply because there are small rounding-off errors involved when converting between projections.

Deleting Selected Features

If we want to delete an entire polygon, we can do that by first selecting the polygon using the regular Select Single Feature tool. You can select multiple features for deletion. Once you have the selection set, use the Delete Selected tool to delete the features.

The Cut Features tool on the digitizing toolbar can also be used to delete features. This effectively deletes the feature but also places it on a "spatial clipboard". So we cut the feature to delete. We could then use the Paste Features tool to put it back, giving us a one-level undo capability. Cut, copy, and paste work on the currently selected features, meaning we can operate on more than one at a time.

Saving Edited Layers

When a layer is in editing mode, any changes remain in the memory of QGIS. Therefore they are not committed/saved immediately to the data source or disk. If you want to save edits to the current layer but want to continue editing without leaving the editing mode, you can click the Save Layer Edits button. When you turn editing mode off with the Toggle editing (or quit QGIS for that matter), you are also asked if you want to save your changes or discard them.

If the changes cannot be saved (e.g. disk full, or the attributes have values that are out of range), the QGIS in-memory state is preserved. This allows you to adjust your edits and try again.

Tip: Data Integrity

It is always a good idea to back up your data source before you start editing. While the authors of QGIS have made every effort to preserve the integrity of your data, we offer no warranty in this regard.

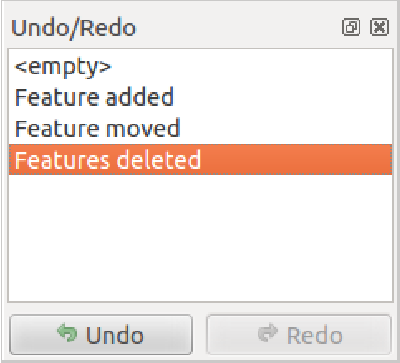
12.3.5 Advanced digitizing

Icon	Purpose	Icon	Purpose
	Undo		Redo
	Rotate Feature(s)		Simplify Feature
	Add Ring		Add Part
	Delete Ring		Delete Part
	Reshape Features		Offset Curve
	Split Features		Merge Selected Features
	Rotate Point Symbols		Merge Attributes of Selected Features

Table Advanced Editing: Vector layer advanced editing toolbar

Undo and Redo

The Undo and Redo tools allow the user to undo or redo vector editing operations. There is also a dockable widget, which shows all operations in the undo/redo history (see Figure_edit_3). This widget is not displayed by default; it can be displayed by right clicking on the toolbar and activating the Undo/Redo check box. Undo/Redo is however active, even if the widget is not displayed.



Undo/Redo

<empty>

Feature added

Feature moved

Features deleted

Gambar 12.33: Redo and Undo digitizing steps

When Undo is hit, the state of all features and attributes are reverted to the state before the reverted operation happened. Changes other than normal vector editing operations (for example changes done by a plugin), may or may not be reverted, depending on how the changes were performed.

To use the undo/redo history widget simply click to select an operation in the history list; all features will be reverted to the state they were in after the selected operation.

Rotate Feature(s)

Use the Rotate Feature(s) to rotate one or multiple selected features in the map canvas. You first need to select the features and then press the Rotate Feature(s) Icon. Then the centroid of the feature appears and will be the rotation anchor point. If you selected multiple features the rotation anchor point will be the common center of the features. Press and drag the left mouse button in the desired direction to rotate the selected features.

It's also possible to create a user-defined rotation anchor point by which the selected feature will rotate. Select the features to rotate and activate the Rotate Feature(s) Tool. Press and hold the `Ctrl` button and move the mouse pointer (without pressing the mouse button) to the place where you want the rotation anchor to be moved. Release the `Ctrl` button when the desired rotation anchor point is reached. Now press and drag the left mouse button in the desired direction to rotate the selected feature(s).

Simplify Feature

The Simplify Feature tool allows to reduce the number of vertices of a feature, as long as the geometry doesn't change. You need to select a feature, it will be highlighted by a red rubber band and a slider appears. Moving the slider, the red rubber band is changing its shape to show how the feature is being simplified. Clicking **[OK]** the new, simplified geometry will be stored. If a feature cannot be simplified (e.g. MultiPolygons), a message shows up.

Add Ring

You can create ring polygons using the Add Ring icon in the toolbar. This means inside an existing area it is possible to digitize further polygons, that will occur as a 'hole', so only the area in between the boundaries of the outer and inner polygons remain as a ring polygon.

Add Part

You can add part polygons to a selected multipolygon. The new part polygon has to be digitized outside the selected multipolygon.

Delete Ring

The Delete Ring tool allows to delete ring polygons inside an existing area. This tool only works with polygon layers. It doesn't change anything when it is used on the outer ring of the polygon. This tool can be used on polygon and multi-polygon features. Before you select the vertices of a ring, adjust the vertex edit tolerance.

Delete Part

The Delete Part tool allows to delete parts from multifeatures (e.g. to delete polygons from a multipolygon feature). It won't delete the last part of the feature, this last part will stay untouched. This tool works with all multi-part geometries point, line and polygon. Before you select the vertices of a part, adjust the vertex edit tolerance.

Reshape Features

You can reshape line and polygon features using the Reshape Features icon on the toolbar. It replaces the line or polygon part from the first to the last intersection with the original line. With polygons this can sometimes lead to unintended results. It is mainly useful to replace smaller parts of a polygon, not major overhauls and the reshape line is not allowed to cross several polygon rings as this would generate an invalid polygon.

For example, you can edit the boundary of a polygon with this tool. First, click in the inner area of the polygon next to the point where you want to add a new vertex. Then, cross the boundary and add the vertices outside the polygon. To finish, right-click in the inner area of the polygon. The tool will automatically add a node where the new line crosses the border. It is also possible to remove part of the area from the polygon, starting the new line outside the polygon, adding vertices inside, and ending the line outside the polygon with a right click.

Catatan: The reshape tool may alter the starting position of a polygon ring or a closed line. So the point that is represented 'twice' will not be the same any more. This may not be a problem for most applications, but it is something to consider.

Offset Curves

The Offset Curve tool creates parallel shifts of line layers. The tool can be applied to the edited layer (the geometries are modified) or also to background layers (creates copies of the lines / rings and adds it to the the edited layer). It is thus ideally suited for the creation of distance line layers. The displacement is shown at the bottom left of the taskbar. To create a shift of a line layer you have to go into editing mode and then select the feature. You can make the Offset Curve tool active and drag the cross to the desired distance. Your changes then can be saved with the Save Layer Edits tool.

Split Features

You can split features using the Split Features icon on the toolbar. Just draw a line across the feature you want to split.

Merge selected features

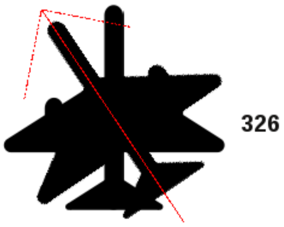
The Merge Selected Features tool allows to merge features that have common boundaries and the same attributes.

Merge attributes of selected features

The Merge Attributes of Selected Features tool allows to merge attributes of features with common boundaries and attributes without merging their boundaries. You can merge the attributes when selecting several features at once. Then press the Merge Attributes of Selected Features button. Now QGIS offers you which attributes are to be applied to all selected objects. As a result, all objects have the same attribute entries.

Rotate Point Symbols

The Rotate Point Symbols allows to change the rotation of point symbols in the map canvas. You have to define a rotation column from the attribute table of the point layer in the *Advanced* menu of the *Style* menu of the *Layer Properties*. Also you have to go into the 'SVG marker' and choose *Data defined properties ...*. Activate ☑ *Angle* and choose 'rotation' as field. Without these settings the tool is inactive.



Gambar 12.34: Rotate Point Symbols

To change the rotation, select a point feature in the map canvas and rotate it holding the left mouse button pressed. A red arrow with the rotation value will be visualized (see Figure_edit_4). When you release the left mouse button again, the value will be updated in the attribute table.

Catatan: If you hold the `Ctrl` key pressed, the rotation will be done in 15 degree steps.

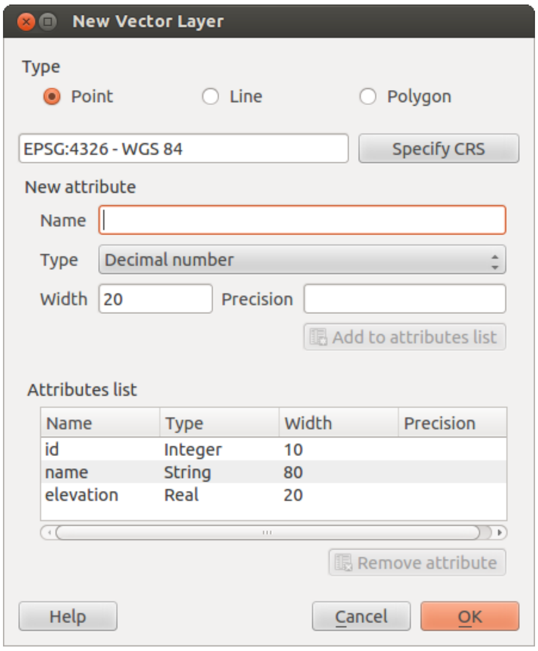
12.3.6 Creating new Vector layers

QGIS allows to create new Shapefile layers, new SpatiaLite layers, and new GPX Layers. Creation of a new GRASS layer is supported within the GRASS-plugin. Please refer to section *Creating a new GRASS vector layer* for more information on creating GRASS vector layers.

Creating a new Shapefile layer

To create a new Shape layer for editing, choose *New* → *New Shapefile Layer...* from the *Layer* menu. The *New Vector Layer* dialog will be displayed as shown in Figure_edit_5. Choose the type of layer (point, line or polygon) and the CRS (Coordinate Reference System).

Note that QGIS does not yet support creation of 2.5D features (i.e. features with X,Y,Z coordinates).



● Point ○ Line ○ Polygon

EPSG:4326 - WGS 84

Name:

Type: Decimal number

Width: 20

Precision:

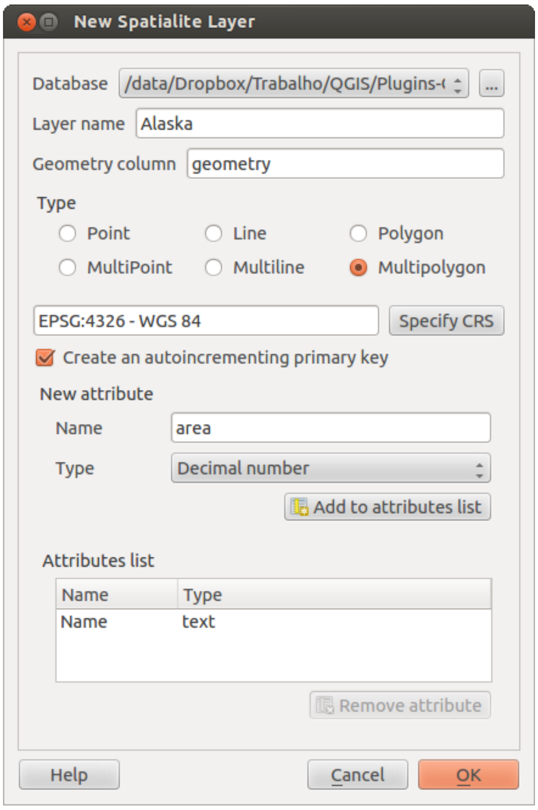
Name	Type	Width	Precision
id	Integer	10	
name	String	80	
elevation	Real	20	

Gambar 12.35: Creating a new Shapefile layer Dialog

To complete the creation of the new Shapefile layer, add the desired attributes by clicking on the **[Add to attributes list]** button and specifying a name and type for the attribute. A first 'id' column is added as default but can be removed, if not wanted. Only *Type: real*, *Type: integer*, *Type: string* and *Type:date* attributes are supported. Additionally and according to the attribute type you can also define the width and precision of the new attribute column. Once you are happy with the attributes, click **[OK]** and provide a name for the shapefile. QGIS will automatically add a `.shp` extension to the name you specify. Once the layer has been created, it will be added to the map and you can edit it in the same way as described in Section *Digitizing an existing layer* above.

Creating a new SpatiaLite layer

To create a new SpatiaLite layer for editing, choose *New* → *New SpatiaLite Layer...* from the *Layer* menu. The *New SpatiaLite Layer* dialog will be displayed as shown in Figure_edit_6.



Database /data/Dropbox/Trabalho/QGIS/Plugins-(

Layer name Alaska

Geometry column geometry

Type

○ Point ○ Line ○ Polygon

○ MultiPoint ○ Multiline ● Multipolygon

EPSG:4326 - WGS 84

☑ Create an autoincrementing primary key

New attribute

Name area

Type Decimal number

Attributes list

Name	Type
Name	text

Gambar 12.36: Creating a New SpatiaLite layer Dialog

First step is to select an existing SpatiaLite database or to create a new SpatiaLite database. This can be done with the browse button ... to the right of the database field. Then add a name for the new layer and define the layer type and specify the Coordinate Reference System with **[Specify CRS]**. If desired you can select to ☑ *Create an autoincrementing primary key*.

To define an attribute table for the new SpatiaLite layer, add the names of the attribute columns you want to create with the according column type and click on the **[Add to attribute list]** button. Once you are happy with the attributes, click **[OK]**. QGIS will automatically add the new layer to the legend and you can edit it in the same way as described in Section *Digitizing an existing layer* above.

Further management of SpatiaLite-Layers can be done with the DB Manager see *Plugin Pengelola DB*.

Creating a new GPX layer

To create a new GPX file you need to load the GPS plugin first. *Plugins* → *Plugin Manager...* opens the Plugin Manager Dialog. Activate the ☑ *GPS Tools* checkbox.

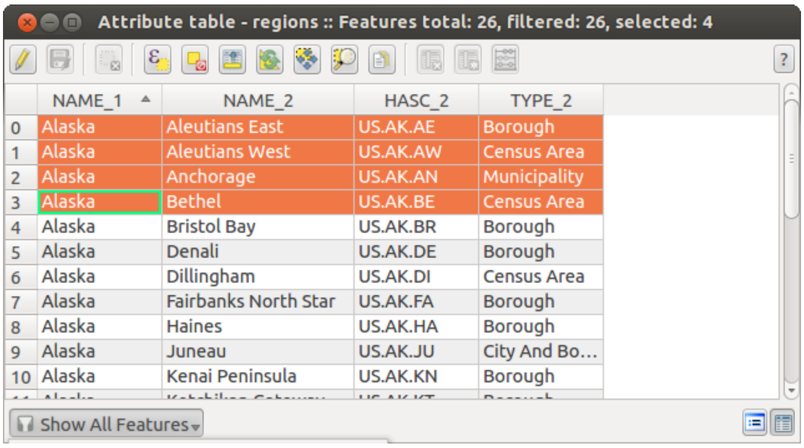
When this plugin is loaded choose *New* → *Create new GPX Layer...* from the *Layer*. In the *Save new GPX file as* dialog you can choose where to save the new GPX layer.

12.3.7 Working with the Attribute Table

The attribute table displays features of a selected layer. Each row in the table represents one map feature and each column contains a particular piece of information about the feature. Features in the table can be searched, selected, moved or even edited.

To open the attribute table for a vector layer, make the layer active by clicking on it in the map legend area. Then from the main menu *Layer* choose *Open Attribute Table*. It is also possible to rightclick on the layer and choose *Open Attribute Table* from the dropdown menu and to click on the *Open Attribute Table* button in the Attributes toolbar.

This will open a new window which displays the feature attributes in the layer (figure_attributes_1). The number of features and the number of selected features are shown in the attribute table title.



Attribute table - regions :: Features total: 26, filtered: 26, selected: 4

	NAME_1	NAME_2	HASC_2	TYPE_2
0	Alaska	Aleutians East	US.AK.AE	Borough
1	Alaska	Aleutians West	US.AK.AW	Census Area
2	Alaska	Anchorage	US.AK.AN	Municipality
3	Alaska	Bethel	US.AK.BE	Census Area
4	Alaska	Bristol Bay	US.AK.BR	Borough
5	Alaska	Denali	US.AK.DE	Borough
6	Alaska	Dillingham	US.AK.DI	Census Area
7	Alaska	Fairbanks North Star	US.AK.FA	Borough
8	Alaska	Haines	US.AK.HA	Borough
9	Alaska	Juneau	US.AK.JU	City And Bo…
10	Alaska	Kenai Peninsula	US.AK.KN	Borough

Gambar 12.37: Attribute Table for regions layer

Selecting features in an attribute table

Each selected row in the attribute table displays the attributes of a selected feature in the layer. If the set of features selected in the main window is changed, the selection is also updated in the attribute table. Likewise, if the set of rows selected in the attribute table is changed, the set of features selected in the main window will be updated.

Rows can be selected by clicking on the row number on the left side of the row. **Multiple rows** can be marked by holding the `Ctrl` key. A **continuous selection** can be made by holding the `Shift` key and clicking on several row headers on the left side of the rows. All rows between the current cursor position and the clicked row are selected. Moving the cursor position in the attribute table, by clicking a cell in the table, does not change the row selection. Changing the selection in the main canvas does not move the cursor position in the attribute table.

The table can be sorted by any column, by clicking on the column header. A small arrow indicates the sort order (downward pointing means descending values from the top row down, upward pointing means ascending values from the top row down).

For a **simple search by attributes** on only one column choose the *Column filter* → from the menu in the bottom left corner. Select the field (column) from which the search should be performed from the dropdown menu and hit the **[Apply]** button. Then only the matching features are shown in the Attribute table.

To make a selection you have to use the Select features using an Expression icon on top of the Attribute table. The Select features using an Expression allows you to define a subset of a table using a *Function List* like in the Field Calculator (see *Field Calculator*). The query result then can be saved as a new vector layer. For example if you want to find regions that are boroughs from the regions.shp of the QGIS sample data you have to open the >*Fields and Values* menu and choose the field that you want to query. Double-klick the field 'TYPE_2' and also **[Load all unique values]** . From list choose and double-klick 'Borough'. In the *Expression* field the following query appears:

```
"TYPE_2" = 'Borough'
```

The matching rows will be selected and the total number of matching rows will appear in the title bar of the attribute table, and in the status bar of the main window. For searches that display only selected features on the map use the Query Builder described in Section *Query Builder*.

To show selected records only, use *Show Selected Features* from the menu at the bottom left.

The other buttons at the top of the attribute table window provide following functionality:

- Toggle editing mode to edit single values and to enable functionalities described below also with `Ctrl+E`
- Save Edits also with `Ctrl+S`
- Unselect all also with `Ctrl+U`
- Move selected to top also with `Ctrl+T`
- Invert selection also with `Ctrl+R`
- Copy selected rows to clipboard also with `Ctrl+C`
- Zoom map to the selected rows also with `Ctrl+J`
- Pan map to the selected rows also with `Ctrl+P`
- Delete selected features also with `Ctrl+D`
- New Column for PostGIS layers and for OGR layers with GDAL version >= 1.6 also with `Ctrl+W`
- Delete Column for PostGIS layers and for OGR layers with GDAL version >= 1.9 also with `Ctrl+L`
- Open field calculator also with `Ctrl+I`

Tip: Skip WKT geometry

If you want to use attribute data in external programs (such as Excel) use the Copy selected rows to clipboard button. You can copy the information without vector geometries if you deactivate *Settings* → *Options* → Data sources menu ☑ *Copy geometry in WKT representation from attribute table*.

Save selected features as new layer

The selected features can be saved as any OGR supported vector format and also transformed into another Coordinate Reference System (CRS). Just open the right mouse menu of the layer and click on *Save selection as* → to define the name of the output file, its format and CRS (see Section *Legenda Peta*). It is also possible to specify OGR creation options within the dialog.

Working with non spatial attribute tables

QGIS allows also to load non spatial tables. This includes currently tables supported by OGR, delimited text as well as the PostgreSQL, MSSQL and Oracle provider. The tables can be used for field lookups or just generally browsed and edited using the table view. When you load the table you will see it in the legend field. It can be opened e.g. with the Open Attribute Table tool and is then editable like any other layer attribute table.

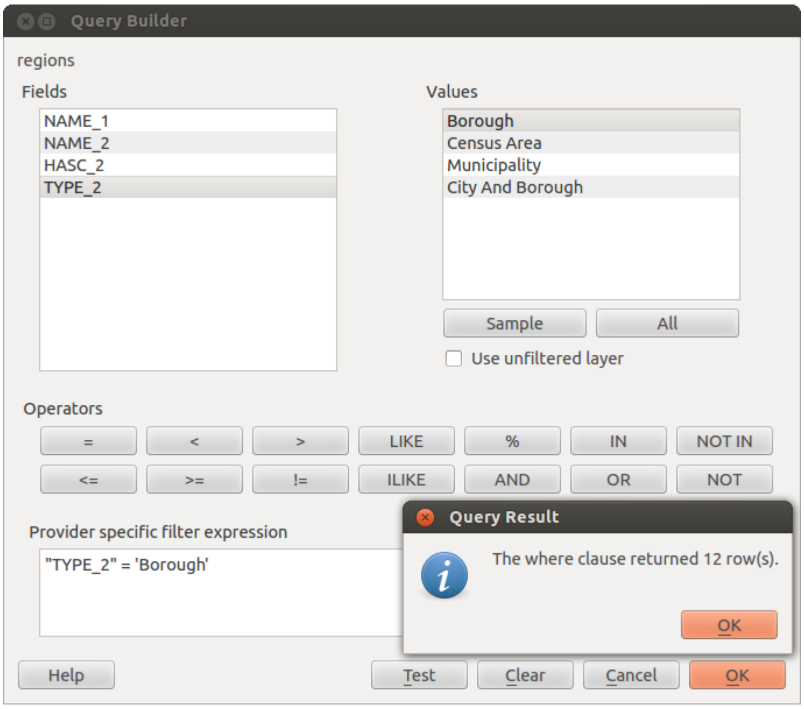
As an example you can use columns of the non spatial table to define attribute values or a range of values that are allowed to be added to a specific vector layer during digitizing. Have a closer look at the edit widget in section *Fields Menu* to find out more.

12.4 Query Builder

The Query Builder allows you to define a subset of a table using a SQL-like WHERE clause and display the result in the main window. The query result then can be saved as a new vector layer.

12.4.1 Query

Open the **Query Builder** by opening the Layer Properties and go to the *General* menu. Under *Feature subset* click on the **[Query Builder]** button to open the *Query builder*. For example, if you have a `regions` layer with a `TYPE_2` field you could select only regions that are `borough` in the *Provider specific filter expression* box of the Query builder. Figure_attributes_2 shows an example of the Query builder populated with the regions.shp layer from the QGIS sample data. The Fields, Values and Operators sections help the user to construct the SQL-like query.


Query Builder
regions
Fields
NAME_1
NAME_2
HASC_2
TYPE_2
Values
Borough
Census Area
Municipality
City And Borough
Sample
All
☐ Use unfiltered layer
Operators
=
<
>
LIKE
%
IN
NOT IN
<=
>=
!=
ILIKE
AND
OR
NOT
Provider specific filter expression
Query Result
OK
Help
Test
Clear
Cancel
OK

"TYPE_2" = 'Borough'

The where clause returned 12 row(s).

Gambar 12.38: Query Builder

The **Fields list** contains all attribute columns of the attribute table to be searched. To add an attribute column to the SQL where clause field, double click its name in the Fields list. Generally you can use the various fields, values and operators to construct the query or you can just type it into the SQL box.

The **Values list** lists the values of an attribute table. To list all possible values of an attribute, select the attribute in the Fields list and click the **[all]** button. To list the first 25 unique values of an attribute column, select the attribute column in the Fields list and click the **[Sample]** button. To add a value to the SQL where clause field, double click its name in the Values list.

The **Operators section** contains all usable operators. To add an operator to the SQL where clause field, click the appropriate button. Relational operators (= , > , ...), string comparison operator (`LIKE`), logical operators (`AND`, `OR`, ...) are available.

The **[Test]** button shows a message box with the number of features satisfying the current query, which is usable in the process of query construction. The **[Clear]** button clears the text in the SQL where clause text field. The **[OK]** button closes the window and selects the features satisfying the query. The **[Cancel]** button closes the window without changing the current selection.

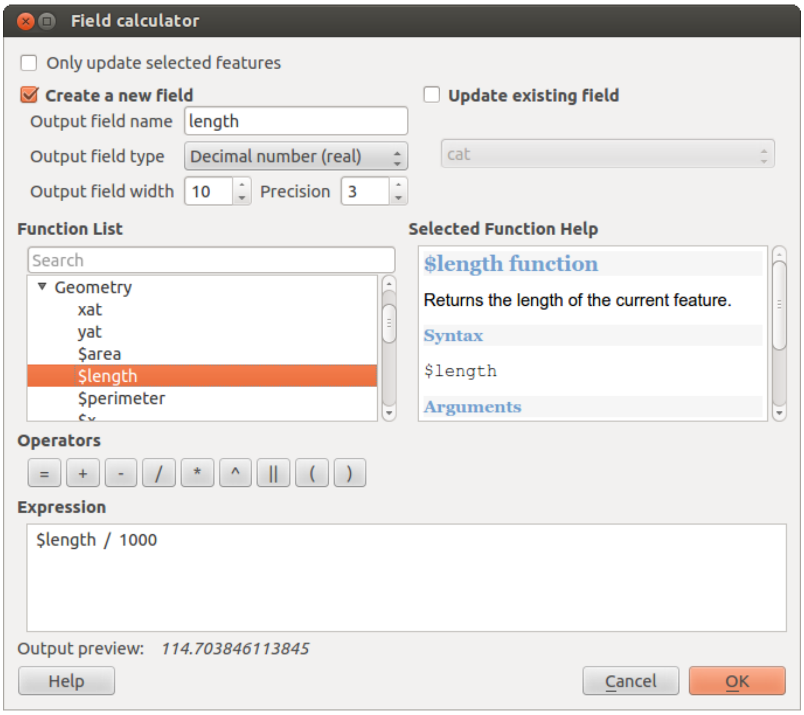
12.4.2 Save selected features as new layer

The selected features can be saved as any OGR supported vector format and also transformed into another Coordinate Reference System (CRS). Just open the right mouse menu of the layer and click on *Save selection as* → to define the name of the output file, its format and CRS (see Section *Legenda Peta*). It is also possible to specify OGR creation options within the dialog.

12.5 Field Calculator

The Field Calculator button in the attribute table allows to perform calculations on basis of existing attribute values or defined functions, e.g to calculate length or area of geometry features. The results can be written to a new attribute column or it can be used to update values in an already existing column.

You have to bring the vector layer in editing mode, before you can click on the field calculator icon to open the dialog (see figure_attributes_3). In the dialog you first have to select whether you want to only update selected features, create a new attribute field where the results of the calculation will be added or update an existing field.


Field calculator

☐ Only update selected features

☑ Create a new field

Output field name: length

Output field type: Decimal number (real)

Output field width: 10 Precision: 3

☐ Update existing field

cat

Function List

Selected Function Help

$length function

Returns the length of the current feature.

Syntax

$length

Arguments

Operators

Expression

$length / 1000

Output preview: 114.703846113845

Gambar 12.39: Field Calculator

If you choose to add a new field, you need to enter a field name, a field type (integer, real or string), the total field width, and the field precision (see figure_attributes_3). For example, if you choose a field width of 10 and a field precision of 3 it means you have 6 signs before the dot, then the dot and another 3 signs for the precision.

The **Function List** contains functions as well as fields and values. View the help function in the **Selected Function Help**. In **Expression** you see the calculation expressions you create with the **Function List**. The most commonly used operators, see **Operators**.

In the **Function List**, click on *Fields and Values* to view all attributes of the attribute table to be searched. To add an attribute to the Field calculator **Expression** field, double click its name in the *Fields and Values* list. Generally you can use the various fields, values and functions to construct the calculation expression or you can just type it into the box. To display the values of a field, you just right click on the appropriate field. You can choose between *Load top 10 unique values* and *Load all unique values*. On the right side opens the **Field Values** list with the unique values. To add a value to the Field calculator **Expression** box, double click its name in the **Field Values** list.

The *Operators*, *Math*, *Conversions*, *String*, *Geometry* and *Record* groups provides several functions. In *Operators* you find mathematical operators. Find *Math* for mathematical functions. The *Conversions* group contains functions that convert one data type to another. The *String* group provides functions for data strings. In the *Geometry* group you find functions for geometry objects. With *Record* group functions you can add a numeration to your data set. To add a function to the Field calculator **Expression** box, click on the > and then doubleclick the function.

A short example illustrates how the field calculator works. We want to calculate the length in km of the `railroads` layer from the QGIS sample dataset:

1. Load the Shapefile `railroads.shp` in QGIS and press Open Attribute Table.
2. Click on Toggle editing mode and open the Field Calculator dialog.
3. Select the ☑ *Create a new field* checkbox to safe the calculations into a new field.
4. Add `length` as Output field name, `real` as Output field type and define Output field width 10 and a Precision of 3.
5. Now doubleclick on function `$length` in the *Geometry* group to add it into the Field calculator expression box.
6. Complete the expression by typing ''/ 1000" in the Field calculator expression box and click **[Ok]**.
7. You can now find a new column `length` in the attribute table.

The available functions are listed below.

The field calculator **Function list** with the **Selected Function Help** , **Operators** and **Expression** menu are also available through the rule-based rendering in the Style menu of the Layer properties and the expression based labeling ... in the Labeling core application.

Operators

This group contains operators e.g + - *

`a + b`	`a plus b`
`a - b`	`a minus b`
`a * b`	`a multiplied by b`
`a / b`	`a divided by b`
`a % b`	`a modulo b for example 7 % 2 = 1 -> 2 fits into 7 three times rest is 1`
`a ^ b`	`a power b for example 2^2=4 or 2^3=8`
`a = b`	`a and b are equal`
`a > b`	`a is larger than b`
`a < b`	`a is smaller than b`
`a <> b`	`a and b are not equal`
`a != b`	`a and b are not equal`
`a <= b`	`a is less than or equal to b`
`a >= b`	`a is larger than or equal to b`
`a ~ b`	`a matches the regular expression b`
`+ a`	`positive sign`
`- a`	`negative value of a`
`||`	`joins two values together into a string 'Hello' || ' world'`
`LIKE`	`returns 1 if the string matches the supplied pattern`
`ILIKE`	`returns 1 if the string matches case-insensitive the supplied pattern. ILIKE can be used instead of LIKE to make the match case-insensitive`
`IS`	`returns 1 if a is the same as b`
`OR`	`returns 1 when condition a or b is true`
`AND`	`returns 1 when condition a and b are true`
`NOT`	`returns 1 if a is not the same as b`
`column name "column name"`	`value of the field column name`
`'string'`	`a string value`
`NULL`	`null value`
`a IS NULL`	`a has no value`
`a IS NOT NULL`	`a has a value`

a IN (value[,value])	a is below the values listed
a NOT IN (value[,value])	a is not below the values listed

Conditionals

This group contains functions to handle conditional checks in expressions.

CASE	evaluates multiple expressions and return a result
CASE ELSE	evaluates multiple expressions and return a result
coalesce	returns the first non-NULL value from the expression list
regexp_match	returns true if any part of a string matches the supplied regular expression

Mathematical Functions

This group contains math functions e.g square root, sin and cos

sqrt(a)	square root of a
abs	returns the absolute value of a number.
sin(a)	sinus of a
cos(a)	cosinus of a
tan(a)	tangens of a
asin(a)	arcussinus of a
acos(a)	arcuscosinus of a
atan(a)	arcustangens of a
atan2(y,x)	arcustangens of y/x using the signs of the two arguments to determine the quadrant of the result
exp	exponential of an value
ln	value of the natural logarithm of the passed expression
log10	value of the base 10 logarithm of the passed expression
log	value of the logarithm of the passed value and base
round	number to number of decimal places
rand	random integer within the range specified by the minimum and maximum argument (inclusive)
randf	random float within the range specified by the minimum and maximum argument (inclusive)
max	largest value in a set of values
min	smallest value in a set of values
clamp	restricts an input value to a specified range
scale_linear	transforms a given value from an input domain to an output range using linear interpolation
scale_exp	transforms a given value from an input domain to an output range using an exponential curve
floor	rounds a number downwards
ceil	rounds a number upwards
$pi	pi as value for calculations

Conversions

This group contains functions to convert on data type to another e.g string to integer, integer to string.

toint	converts a string to integer number
toreal	converts a string to real number
tostring	convert number to string
todatetime	convert a string into Qt data time type
todate	convert a string into Qt data type
totime	convert a string into Qt time type
tointerval	converts a string to a interval type. Can be used to take days, hours, month, etc off a date

Date and Time Functions

This group contains functions for handling date and time data.

```
$now       current date and time
age        difference between two dates
year       extract the year part from a date, or the number of years from a Interval
month      extract the month part from a date, or the number of months from a Interval
week       extract the week number from a date, or the number of weeks from a Interval
day        extract the day from a date, or the number of days from a Interval
hour       extract the hour from a datetime or time, or the number
           of hours from a Interval
minute     extract the minute from a datetime or time, or the number
           of minutes from a Interval
second     extract the second from a datetime or time, or the number
           of minutes from a Interval
```

String Functions

This group contains functions that operate on strings e.g replace, convert to upper case.

```
lower         convert string a to lower case
upper         convert string a to upper case
title         converts all words of a string to title case (all words lower case
              with leading capital letter)
trim          removes all leading and trailing whitespace (spaces, tabs, etc) from a string
length        length of string a
replace       returns a string with the the supplied string replaced
regexp_replace(a,this,that)  returns a string with the supplied regular expression replaced
regexp_substr    returns the portion of a string which matches a supplied regular expression
substr(*a*,from,len)         returns a part of a string
concat        concatenates several strings to one
strpos        returns the index of a regular expression in a string
left          returns a substring that contains the n leftmost characters of the string
right         returns a substring that contains the n rightmost characters of the string
rpad          returns a string with supplied width padded using the fill character
lpad          returns a string with supplied width padded using the fill character
format        formats a string using supplied arguments
format_number   returns a number formatted with the locale separator for thousands.
                Also truncates the number to the number of supplied places
format_date   formats a date type or string into a custom string format
```

Color Functions

This group contains functions for manipulating colors.

```
color_rgb       returns a string representation of a color based on its red, green,
                and blue components
color_rgba      returns a string representation of a color based on its red, green,
                blue, and alpha (transparency) components
ramp_color      returns a string representing a color from a color ramp
color_hsl       returns a string representation of a color based on its hue,
                saturation, and lightness attributes
color_hsla      returns a string representation of a color based on its hue, saturation,
                lightness and alpha (transparency) attributes
color_hsv       returns a string representation of a color based on its hue,
                saturation, and value attributes
color_hsva      returns a string representation of a color based on its hue, saturation,
                value and alpha (transparency) attributes
color_cmyk      returns a string representation of a color based on its cyan, magenta,
                yellow and black components
color_cmyka     returns a string representation of a color based on its cyan, magenta,
                yellow, black and alpha (transparency) components
```

Geometry Functions

This group contains functions that operate on geometry objects e.g length, area.

xat	retrieves a x coordinate of the current feature
yat	retrieves a y coordinate of the current feature
$area	returns the area size of the current feature
$length	returns the area size of the current feature
$perimeter	returns the perimeter length of the current feature
$x	returns the x coordinate of the current feature
$y	returns the y coordinate of the current feature
$geometry	returns the geometry of the current feature. Can be used for processing with other functions.
geomFromWKT	returns a geometry created from a Well-Known Text (WKT) representation.
geomFromGML	returns a geometry from a GML representation of geometry
bbox	
disjoint	returns 1 if the Geometries do not share any space together
intersects	returns 1 if the geometries spatially intersect (share any portion of space) and 0 if they don’t
touches	returns 1 if the geometries have at least one point in common, but their interiors do not intersect
crosses	returns 1 if the supplied geometries have some, but not all, interior points in common.
contains	returns true if and only if no points of b lie in the exterior of a, and at least one point of the interior of b lies in the interior of a
overlaps	returns 1 if the Geometries share space, are of the same dimension, but are not completely contained by each other.
within	returns 1 if the geometry a is completely inside geometry b
buffer	returns a geometry that represents all points whose distance from this geometry is less than or equal to distance
centroid	returns the geometric center of a geometry
convexHull	returns the convex hull of a geometry. It represents the minimum convex geometry that encloses all geometries within the set
difference	returns a geometry that represents that part of geometry a that does not intersect with geometry a
distance	returns the minimum distance (based on spatial ref) between two geometries in projected units
intersection	returns a geometry that represents the shared portion of geometry a and geometry b
symDifference	returns a geometry that represents the portions of a and b that do not intersect
combine	returns the combination of geometry a and geometry b
union	returns a geometry that represents the point set union of the geometries
geomToWKT	returns the Well-Known Text (WKT) representation of the geometry without SRID metadata

Record Functions

This group contains functions that operate on record identifiers.

$rownum	returns the number of the current row
$id	returns the feature id of the current row
$scale	returns the current scale of the map canvas

Fields and Values

Contains a list of fields from the layer. Sample values can also be accessed via right-click.

Select the field name from the list then right-click to access context menu with options to load sample values from the selected field.

Pekerjaan dengan Data Raster

13.1 Working with Raster Data

This Section describes how to visualize and set raster layer properties. QGIS uses the GDAL library to read and write raster data formats, including Arc/Info Binary Grid, Arc/Info ASCII Grid, GeoTIFF, Erdas Imagine and many more. GRASS raster support is supplied by a native QGIS data provider plugin. The raster data can also be loaded in read mode from zip and gzip archives into QGIS.

At the date of this document, more than 100 raster formats are supported by the GDAL library (see GDAL-SOFTWARE-SUITE *Literatur dan Referensi Web*). A complete list is available at http://www.gdal.org/formats_list.html.

Catatan: Not all of the listed formats may work in QGIS for various reasons. For example, some require external commercial libraries or the GDAL installation of your OS was not built to support the format you want to use. Only those formats that have been well tested will appear in the list of file types when loading a raster into QGIS. Other untested formats can be loaded by selecting the `[GDAL] All files (*)` filter.

Working with GRASS raster data is described in Section *GRASS GIS Integration*.

13.1.1 What is raster data?

Raster data in GIS are matrices of discrete cells that represent features on, above or below the earth's surface. Each cell in the raster grid is the same size, and cells are usually rectangular (in QGIS they will always be rectangular). Typical raster datasets include remote sensing data such as aerial photography or satellite imagery and modelled data such as an elevation matrix.

Unlike vector data, raster data typically do not have an associated database record for each cell. They are geocoded by its pixel resolution and the x/y coordinate of a corner pixel of the raster layer. This allows QGIS to position the data correctly in the map canvas.

QGIS makes use of georeference information inside the raster layer (e.g. GeoTiff) or in an appropriate world file to properly display the data.

13.1.2 Loading raster data in QGIS

Raster layers are loaded either by clicking on the Add Raster Layer icon or by selecting the *Layer* → *Add Raster Layer* menu option. More than one layer can be loaded at the same time by holding down the `Control` or `Shift` key and clicking on multiple items in the dialog *Open a GDAL Supported Raster Data Source*.

Once a raster layer is loaded in the map legend you can click on the layer name with the right mouse button to select and activate layer specific features or to open a dialog to set raster properties for the layer.

Right mouse button menu for raster layers

- *Zoom to layer extent*
- *Zoom to Best Scale (100%)*
- *Show in Overview*
- *Remove*
- *Duplicate*
- *Set Layer CRS*
- *Set Project CRS from Layer*
- *Save as ...*
- *Properties*
- *Rename*
- *Copy Style*
- *Add New Group*
- *Expand all*
- *Collapse all*
- *Update Drawing Order*

13.2 Raster Properties Dialog

To view and set the properties for a raster layer, double click on the layer name in the map legend or right click on the layer name and choose *Properties* from the context menu:

This will open the *Raster Layer Properties* dialog, (see figure_raster_1).

There are several menus in the dialog:

- *General*
- *Style*
- *Transparency*
- *Pyramids*
- *Histogram*
- *Metadata*

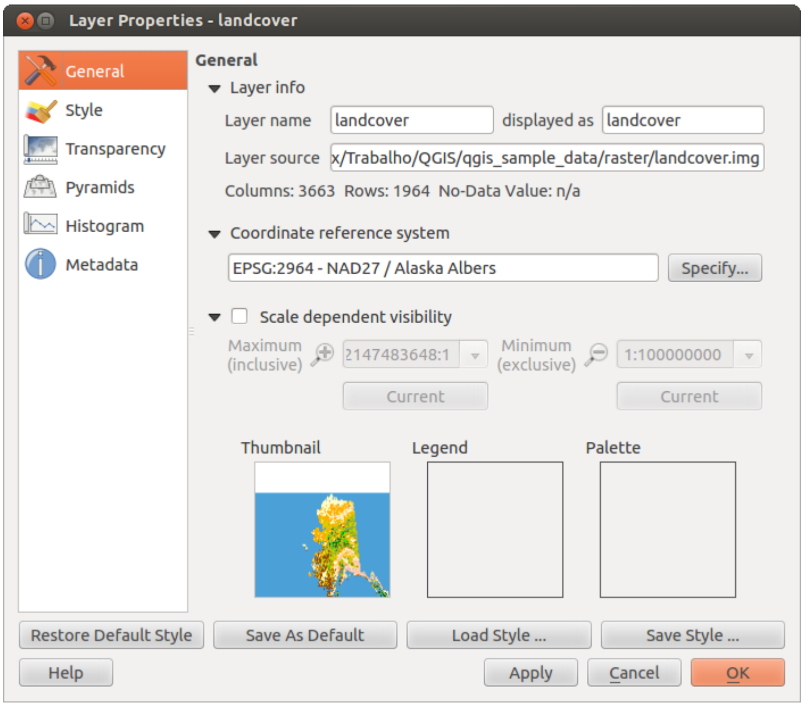
13.2.1 General Menu

Layer Info

The *General* menu displays basic information about the selected raster, including the layer source path, the display name in the legend (which can be modified) and the number of columns, rows and No-Data Values of the raster.

Coordinate reference system

Below you find the coordinate reference system (CRS) information printed as a PROJ.4-string. If this setting is not correct, it can be modified by clicking the **[Specify]** button.


Layer Properties - landcover
General
Style
Transparency
Pyramids
Histogram
Metadata
General
Layer info
Coordinate reference system
Specify...
☐ Scale dependent visibility
Current
Current
Thumbnail
Legend
Palette
Restore Default Style
Save As Default
Load Style ...
Save Style ...
Help
Apply
Cancel
OK

Layer name: landcover displayed as: landcover

Layer source: x/Trabalho/QGIS/qgis_sample_data/raster/landcover.img

Columns: 3663 Rows: 1964 No-Data Value: n/a

EPSG:2964 - NAD27 / Alaska Albers

Maximum (inclusive): 2147483648:1 Minimum (exclusive): 1:100000000

Gambar 13.1: Raster Layers Properties Dialog

Scale Dependent visibility

Additionally Scale Dependent visibility can be set in this tab. You need to check the checkbox and set an appropriate scale where your data will be displayed in the map canvas.

At the bottom you can see a thumbnail of the layer, its legend symbol, and the palette.

13.2.2 Style Menu

Band rendering

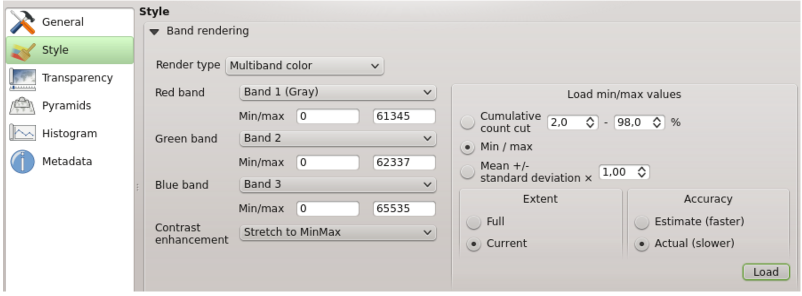
QGIS offers four different *Render types*. The renderer chosen is dependent on the data type.

1. Multiband color - if the file comes as a multi band with several bands (e.g. used with a satellite image with several bands)
2. Paletted - if a single band file comes with an indexed palette (e.g. used with a digital topographic map)
3. Singleband gray- (one band of) the image will be rendered as gray, QGIS will choose this renderer if the file neither has multi bands, nor has an indexed palette nor has a continous palette (e.g. used with a shaded relief map)
4. Singleband pseudocolor - this renderer is possible for files with a continuous palette, e.g. the file has got a color map (e.g. used with an elevation map)

Multiband color

With the multiband color renderer three selected bands from the image will be rendered, each band representing the red, green or blue component that will be used to create a color image. You can choose several *Contrast enhancement* methods: 'No enhancement', 'Stretch to MinMax', 'Stretch and clip to MinMax' and 'Clip to min max'.

This selection offers you a wide range of options to modify the appearance of your rasterlayer. First of all you have to get the data range from your image. This can be done by choosing the *Extent* and pressing **[Load]**. QGIS can ● *Estimate (faster)* the *Min* and *Max* values of the bands or use the ○ *Actual (slower) Accuracy*.



Render type: Multiband color

Red band: Band 1 (Gray) — Min/max 0, 61345

Green band: Band 2 — Min/max 0, 62337

Blue band: Band 3 — Min/max 0, 65535

Contrast enhancement: Stretch to MinMax

○ Cumulative count cut 2,0 - 98,0 %

● Min / max

○ Mean +/- standard deviation × 1,00

Extent: ○ Full ● Current

Accuracy: ○ Estimate (faster) ● Actual (slower)

Gambar 13.2: Raster Renderer - Multiband color

Now you can scale the colors with the help of the *Load min/max values* section. A lot of images have few very low and high data. These outliers can be eliminated using the ● *Cumulative count cut* setting. The standard data range is set from 2% until 98% of the data values and can be adapted manually. With this setting the gray character of the image can disappear. With the scaling option ○ *Min/max* QGIS creates a color table with the whole data included in the original image. E.g. QGIS creates a color table with 256 values, given the fact that you have 8bit bands. You can also calculate your color table using the ○ *Mean +/- standard deviation x* 1,00 . Then only the values within the standard deviation or within multiple standard deviations are considered for the color table. This is useful when you have one or two cells with abnormally high values in a raster grid that are having a negative impact on the rendering of the raster.

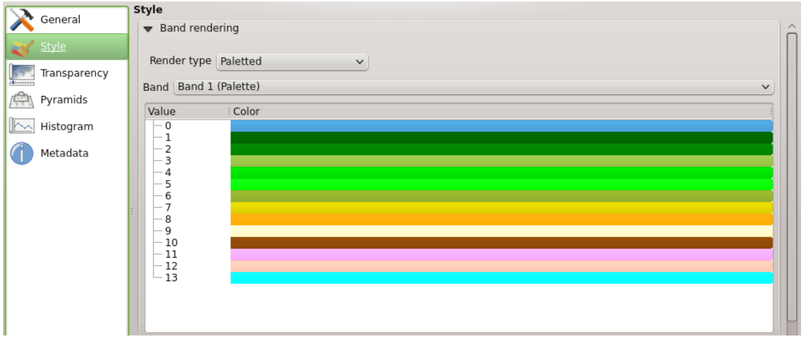
All calculation can also be made for the ○ *Current* extend.

Tip: Viewing a Single Band of a Multiband Raster

If you want to view a single band (for example Red) of a multiband image, you might think you would set the Green and Blue bands to "Not Set". But this is not the correct way. To display the Red band, set the image type to 'Singleband gray', then select Red as the band to use for Gray.

Paletted

This is the standard render option for singleband files that already include a color table, where each pixel value is assigned to a certain color. In that case, the palette is rendered automatically. If you want to change colors assigned to certain values, just double-click on the color and the *Select color* dialog appears.



Render type: Paletted

Band: Band 1 (Palette)

Value	Color
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Gambar 13.3: Raster Renderer - Paletted

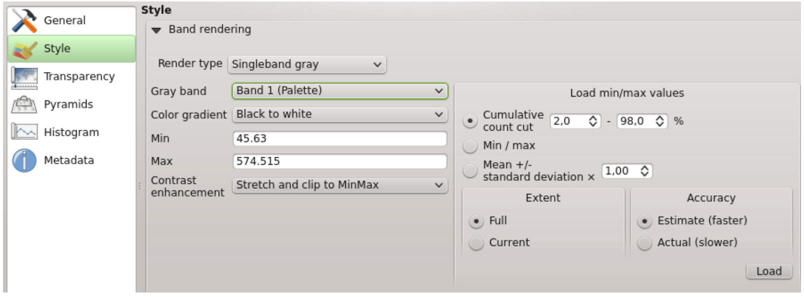
Contrast enhancement

Catatan: When adding GRASS rasters the option *Contrast enhancement* will be always set to automatically to *stretch to min max* regardless if the QGIS general options this is set to another value.

Singleband gray

This renderer allows you to render a single band layer with a *Color gradient* 'Black to white' or 'White to black'. You can define a *Min* and a *Max* value with choosing the *Extend* first and then pressing **[Load]**. QGIS can ●

Estimate (faster) the *Min* and *Max* values of the bands or use the ○ *Actual (slower) Accuracy*.



Style

Band rendering

Render type: Singleband gray

Gray band: Band 1 (Palette)

Color gradient: Black to white

Min: 45.63

Max: 574.515

Contrast enhancement: Stretch and clip to MinMax

Load min/max values

● Cumulative count cut 2,0 - 98,0 %

○ Min / max

○ Mean +/- standard deviation × 1,00

Extent: ● Full ○ Current

Accuracy: ● Estimate (faster) ○ Actual (slower)

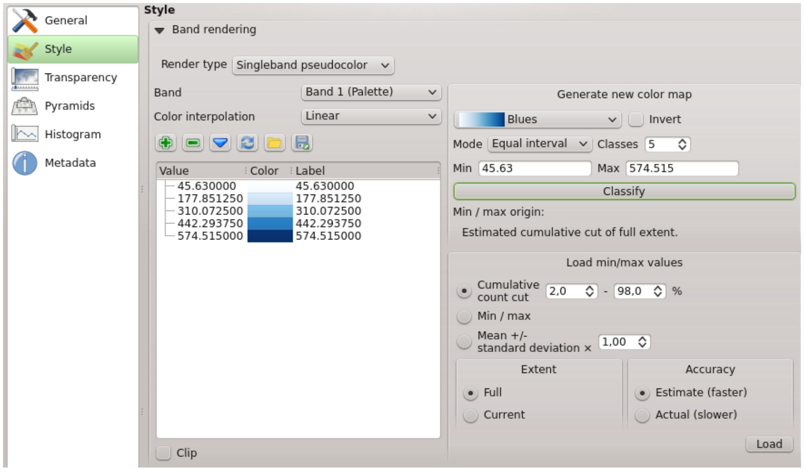
Load

Gambar 13.4: Raster Renderer - Singleband gray

With the *Load min/max values* section scaling of the color table is possible. Outliers can be eliminated using the ● *Cumulative count cut* setting. The standard data range is set from 2% until 98% of the data values and can be adapted manually. With this setting the gray character of the image can disappear. Further settings can be made with ○ *Min/max* and ○ *Mean +/- standard deviation x* 1,00. While the first one creates a color table with the whole data included in the original image the second creates a colortable that only considers values within the standard deviation or within multiple standard deviations. This is useful when you have one or two cells with abnormally high values in a raster grid that are having a negative impact on the rendering of the raster.

Singleband pseudocolor

This is a render option for single band files including a continous palette. You can also create individual color maps for the single bands here. Three types of color interpolation are available:



Style

Band rendering

Render type: Singleband pseudocolor

Band: Band 1 (Palette)

Color interpolation: Linear

Value	Color	Label
45.630000	🟦	45.630000
177.851250	🟦	177.851250
310.072500	🟦	310.072500
442.293750	🟦	442.293750
574.515000	🟦	574.515000

☐ Clip

Generate new color map

Blues ☐ Invert

Mode: Equal interval Classes: 5

Min: 45.63 Max: 574.515

Classify

Min / max origin:

Estimated cumulative cut of full extent.

Load min/max values

● Cumulative count cut 2,0 - 98,0 %

○ Min / max

○ Mean +/- standard deviation × 1,00

Extent: ● Full ○ Current

Accuracy: ● Estimate (faster) ○ Actual (slower)

Load

Gambar 13.5: Raster Renderer - Singleband pseudocolor

1. Discrete
2. Linear
3. Exact

In the left block the button Add values manually adds a value to the individual color table. Button Remove selected row deletes a value from the individual color table and the Sort colormap items button sorts the color table according to the pixel values in the value column. Double clicking on the value-column lets you insert a specific value. Double clicking on the color-column opens the dialog *Change color* where you can select a color to apply on that value. Further you can also add labels for each color but this value won't be displayed when you use the identify feature tool. You can also click on the button Load color map from band, which tries to load the table from the band (if it has any). And you can use the buttons Load color map from file or Export color map to file to load an existing color table or to save the defined color table for other sessions.

In the right block *Generate new color map* allows you to create newly categorized colormaps. For the *Classification mode* ... ▼ 'Equal interval' you only need to select the *number of classes* 1,00 and press the button *Classify*. You can invert the colors of the the color map by clicking the ☑ *Invert* checkbox. In case of the *Mode* ... ▼ 'Continous' QGIS creates classes depending on the *Min* and *Max* automatically. Defining *Min/Max* values can be done with the help of *Load min/max values* section. A lot of images have few very low and high data. These outliers can be eliminated using the ● *Cumulative count cut* setting. The standard data range is set from 2% until 98% of the data values and can be adapted manually. With this setting the gray character of the image can disappear. With the scaling option ○ *Min/max* QGIS creates a color table with the whole data included in the original image. E.g. QGIS creates a color table with 256 values, given the fact that you have 8bit bands. You can also calculate your color table using the ○ *Mean +/- standard deviation x* 1,00 . Then only the values within the standard deviation or within multiple standard deviations are considered for the color table.

Color rendering

For every *Band rendering* a *Color rendering* is possible.

You can achieve special rendering effects for your raster file(s) using one one of the blending modes (see *blend_modes*).

Further settings can be made in modifiying the *Brightness*, the *Saturation* and the *Contrast*. You can use a *Grayscale* option where you can choose between 'By lightness', 'By luminosity' and 'By average'. For one hue in the color table you can modiy the 'Strength'.

Resampling

The *Resampling* option makes it appearance when you zoom in and out of the image. Resampling modes can optimize the appearance of the map. They calculate a new gray value matrix through a geometric transformation.

While applying the 'Nearest neighbour' method the map can have a pixelated structure when zooming in. This appearance can be improved by using the 'Bilinear' or 'Cubic' method. Sharp features are caused to be blurred now. The effect is a smoother image. The method can be applied e.g. to digital topographic raster maps.

13.2.3 Transparency Menu

QGIS has the ability to display each raster layer at varying transparency levels. Use the transparency slider to indicate to what extent the underlying layers (if any) should be visible though the current raster layer. This is very useful, if you like to overlay more than one rasterlayer, e.g. a shaded relief map overlayed by a classified rastermap. This will make the look of the map more three dimensional.

Additionally you can enter a rastervalue, which should be treated as *NODATA* in the *Additional no data value* menu.

An even more flexible way to customize the transparency can be done in the *Custom transparency options* section. The transparency of every pixel can be set here.

As an example we want to set the water of our example raster file `landcover.tif` to a transparency of 20 %. The following steps are neccessary:

1. Load the rasterfile `landcover`.
2. Open the *Properties* dialog by double-clicking on the raster name in the legend or by right-clicking and choosing *Properties* from the popup menu.
3. Select the *Transparency* menu
4. From the *Transparency band* menu choose 'None'.

5. Click the Add values manually button. A new row will appear in the pixel-list.
6. Enter the raster-value (we use 0 here) in the 'From' and 'To' column and adjust the transparency to 20 %.
7. Press the **[Apply]** button and have a look at the map.

You can repeat the steps 5 and 6 to adjust more values with custom transparency.

As you can see this is quite easy to set custom transparency, but it can be quite a lot of work. Therefore you can use the button Export to file to save your transparency list to a file. The button Import from file loads your transparency settings and applies them to the current raster layer.

13.2.4 Pyramids Menu

Large resolution raster layers can slow navigation in QGIS. By creating lower resolution copies of the data (pyramids), performance can be considerably improved as QGIS selects the most suitable resolution to use depending on the level of zoom.

You must have write access in the directory where the original data is stored to build pyramids.

Several resampling methods can be used to calculate the pyramids:

- Nearest Neighbour
- Average
- Gauss
- Cubic
- Mode
- None

If you choose 'Internal (if possible)' from the *Overview format* menu QGIS tries to build pyramids internally. You can also choose 'External' and 'External (Erdas Imagine)'.

Please note that building pyramids may alter the original data file and once created they cannot be removed. If you wish to preserve a 'non-pyramided' version of your raster, make a backup copy prior to building pyramids.

13.2.5 Histogram Menu

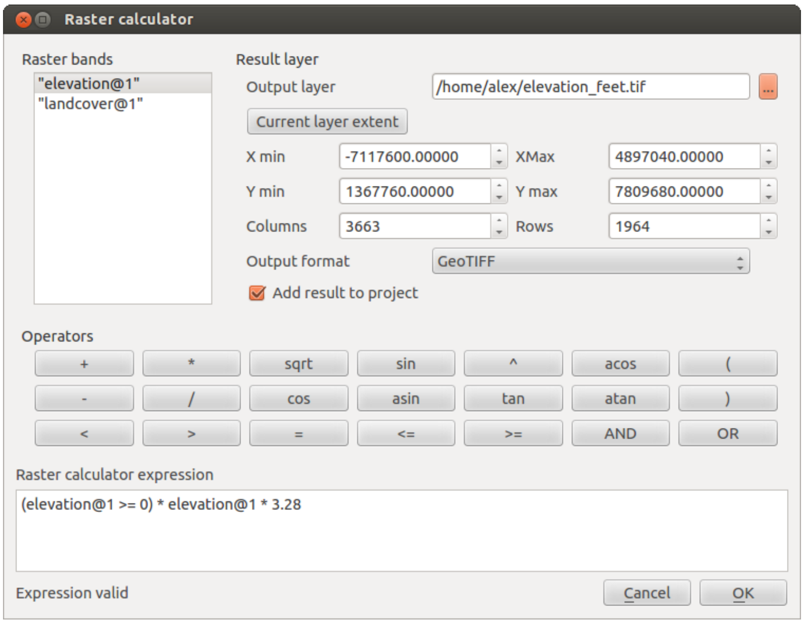
The *Histogram* menu allows you to view the distribution of the bands or colors in your raster. It is generated automatically when you open the *Histogram* menu. All existing bands will be displayed together. You can save the histogram as an image with the button. With the *Visibility* option in the *Prefs/Actions* menu you can display histograms of the individual bands. You will need to select the option ○ *Show selected band*. The *Min/max options* allow you to 'Always show min/max markers', to 'Zoom to min/max' and to 'Update style to min/max'. With the *Actions* option you can 'Reset' and 'Recompute histogram' after you have chosen the *Min/max options*.

13.2.6 Metadata Menu

The *Metadata* menu displays a wealth of information about the raster layer, including statistics about each band in the current raster layer. From this menu entries are made for the *Description*, *Attribution*, *MetadataUrl* and *Properties*. In *Properties* statistics are gathered on a 'need to know' basis, so it may well be that a given layers statistics have not yet been collected.

13.3 Raster Calculator

The *Raster Calculator* in the *Raster* menu (see figure_raster_2) allows to perform calculations on basis of existing raster pixel values. The results are written to a new raster layer with a GDAL supported format.



"elevation@1"
"landcover@1"

Output layer: /home/alex/elevation_feet.tif

X min: -7117600.00000
XMax: 4897040.00000
Y min: 1367760.00000
Y max: 7809680.00000
Columns: 3663
Rows: 1964
Output format: GeoTIFF
☑ Add result to project

(elevation@1 >= 0) * elevation@1 * 3.28

Expression valid

Gambar 13.6: Raster Calculator

The **Raster bands** list contains all loaded raster layers that can be used. To add a raster to the raster calculator expression field, double click its name in the Fields list. You can then use the operators to construct calculation expressions or you can just type it into the box.

In the **Result layer** section you have to define an output layer. You can then define the extent of the calculation area based on an input raster layer or based on X,Y coordinates and on Columns and Rows to set the resolution of the output layer. If the input layer has a different resolution, the values will be resampled with nearest neighbor algorithm.

The **Operators** section contains all usable operators. To add an operator to the raster calculator expression box, click the appropriate button. Mathematical calculations (`+`, `-`, `*`, ...) and trigonometric functions (`sin`, `cos`, `tan`, ...) are available. Stay tuned for more operators to come!

With the ☑ *Add result to project* checkbox the result layer will automatically added to the legend area and can be visualized.

13.3.1 Examples

Convert elevation values from meter to feet

Creating an elevation raster feet from a raster in meter, you need to use the conversion factor for meters to feet: 3.28. The expression is:

```
elevation@1 * 3.28
```

Using a mask

If you want to mask out parts of a raster, because you are only interested in elevations above 0 meter, you can use following expression to create a mask and apply the result to a raster in one step.

```
(elevation@1 >= 0) * elevation@1
```

For every cell greater than or equal to 0, set its value to 1, otherwise set it to 0. This creates the mask on the fly.

BAB 14

Pekerjaan dengan Data OGC

14.1 QGIS as OGC Data Client

The Open Geospatial Consortium (OGC), is an international organization with more than 300 commercial, governmental, nonprofit and research organizations worldwide. Its members develop and implement standards for geospatial content and services, GIS data processing and exchange.

Describing a basic data model for geographic features an increasing number of specifications are developed to serve specific needs for interoperable location and geospatial technology, including GIS. Further information can be found under http://www.opengeospatial.org/.

Important OGC specifications supported by QGIS are:

- **WMS** — Web Map Service (*WMS/WMTS Client*)
- **WMTS** — Web Map Tile Service (*WMS/WMTS Client*)
- **WFS** — Web Feature Service (*WFS and WFS-T Client*)
- **WFS-T** — Web Feature Service - Transactional (*WFS and WFS-T Client*)
- **WCS** — Web Coverage Service (*WCS Client*)
- **SFS** — Simple Features for SQL (*PostGIS Layers*)
- **GML** — Geography Markup Language

OGC services are increasingly being used to exchange geospatial data between different GIS implementations and data stores. QGIS can deal with the above specifications as a client, being **SFS** (through support of the PostgreSQL / PostGIS data provider, see Section *PostGIS Layers*).

14.1.1 WMS/WMTS Client

Overview of WMS Support

QGIS currently can act as a WMS client that understands WMS 1.1, 1.1.1 and 1.3 servers. It has particularly been tested against publicly accessible servers such as DEMIS.

WMS servers act upon requests by the client (e.g. QGIS) for a raster map with a given extent, set of layers, symbolization style, and transparency. The WMS server then consults its local data sources, rasterizes the map, and sends it back to the client in a raster format. For QGIS this would typically be JPEG or PNG.

WMS is generically a REST (Representational State Transfer) service rather than a fully-blown Web Service. As such, you can actually take the URLs generated by QGIS and use them in a web browser to retrieve the same images that QGIS uses internally. This can be useful for troubleshooting, as there are several brands of WMS servers in the market and they all have their own interpretation of the WMS standard.

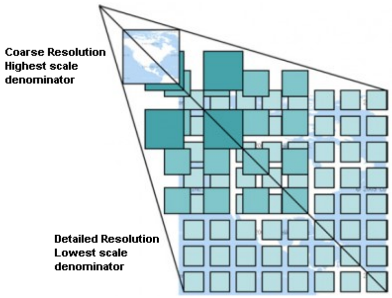
WMS layers can be added quite simply, as long as you know the URL to access the WMS server, you have a serviceable connection to that server, and the server understands HTTP as the data transport mechanism.

Overview of WMTS Support

QGIS can also act as a WMTS client. WMTS is an OGC standard for distributing tile sets of geospatial data. This is a faster and a more efficient way of distributing data than WMS because with WMTS the tile sets are pre-generated and the client only requests the transmission of the tiles and not their production. A WMS request typically involves both the generation and transmission of the data. A well known example of a non-OGC standard for viewing tiled geospatial data is Google Maps.

In order to display the data at a variety of scales close to what the user might want, the WMTS tile sets are produced at several different scale levels and are made available for the GIS client to request them.

This diagram illustrates the concept of tile sets:



Gambar 14.1: Concept of WMTS tile sets

The two types of WMTS interfaces that QGIS supports are via Key-Value-Pairs (KVP) and RESTful. These two interfaces are different and you need to specify them to QGIS differently.

1) In order to access a **WMTS KVP** service, a QGIS user opens the WMS/WMTS interface and adds the following string to the URL of the WMTS tile service:

```
"?SERVICE=WMTS&REQUEST=GetCapabilities"
```

An example of this type of address is

```
http://opencache.statkart.no/gatekeeper/gk/gk.open_wmts?\
  service=WMTS&request=GetCapabilities
```

For testing the topo2 layer in this WMTS works nicely. Adding this string indicates that a WMTS web service is to be used instead of a WMS service

2) The **RESTful WMTS** service takes a different form, it is a straightforward URL, the format recommended by the OGC is:

```
{WMTSBaseURL}/1.0.0/WMTSCapabilities.xml
```

This format helps you to recognize that it is a RESTful address. A RESTful WMTS is accessed in QGIS by simply adding its address in the WMS setup in the URL field of the form. An example for an Austrian basemap of this type of address is http://maps.wien.gv.at/basemap/1.0.0/WMTSCapabilities.xml

Catatan: You can find some old service call WMS-C. Thoses services are quiet similar to WMTS service same purpose but working a little bit differently). You can manage them as the same way you do it for WMTS services. Just add ?tiled=true at the end of the url. See http://wiki.osgeo.org/wiki/Tile_Map_Service_Specification for more information about this specification.

When you read WMTS you can often think WMS-C also.

Selecting WMS/WMTS Servers

The first time you use the WMS feature, there are no servers defined.

Begin by clicking the Add WMS layer button inside the toolbar, or through the *Layer* → *Add WMS Layer...* menu.

The dialog *Add Layer(s) from a Server* for adding layers from the WMS server appears. You can add some servers to play with by clicking the **[Add default servers]** button. This will add two WMS demo servers for you to use, the WMS servers of the DM Solutions Group and Lizardtech. To define a new WMS server in the tab *Layers*, select the **[New]** button. Then enter the parameters to connect to your desired WMS server, as listed in table_OGC_1:

Name	A name for this connection. This name will be used in the Server Connections drop-down box so that you can distinguish it from other WMS Servers.
URL	URL of the server providing the data. This must be a resolvable host name; the same format as you would use to open a telnet connection or ping a host.
Username	Username to access a secured WMS-server. This parameter is optional.
Password	Password for a basic authenticated WMS-server. This parameter is optional.
Ignore GetMap URI	☑ *Ignore GetMap URI reported in capabilities*, use given URI from URL-field above.
Ignore GetFeatureInfo URI	☑ *Ignore GetFeatureInfo URI reported in capabilities* , use given URI from URL-field above

Table OGC 1: WMS Connection Parameters

If you need to set up a proxy-server to be able to receive WMS-services from the internet, you can add your proxy-server in the options. Choose menu *Settings* → *Options* and click on the tab *Network & Proxy*. There you can add your proxy-settings and enable them by setting the ☑ *Use proxy for web access*. Make sure that you select the correct proxy type from the *Proxy type* ▼ dropdown menu.

Once the new WMS Server connection has been created, it will be preserved for future QGIS sessions.

Tip: On WMS Server URLs

Be sure, when entering in the WMS server URL, that you have the base URL. For example, you shouldn't have fragments such as `request=GetCapabilities` or `version=1.0.0` in your URL.

Loading WMS/WMTS Layers

Once you have successfully filled in your parameters you can use the **[Connect]** button to retrieve the capabilities of the selected server. This includes the Image encoding, Layers, Layer Styles and Projections. Since this is a network operation, the speed of the response depends on the quality of your network connection to the WMS server. While downloading data from the WMS server, the download progress is visualized in the left bottom of the WMS dialog.

Your screen should now look a bit like figure_OGR_1, which shows the response provided by the DM Solutions Group WMS server.

Image Encoding

The *Image encoding* section now lists the formats that are supported by both the client and server. Choose one depending on your image accuracy requirements.

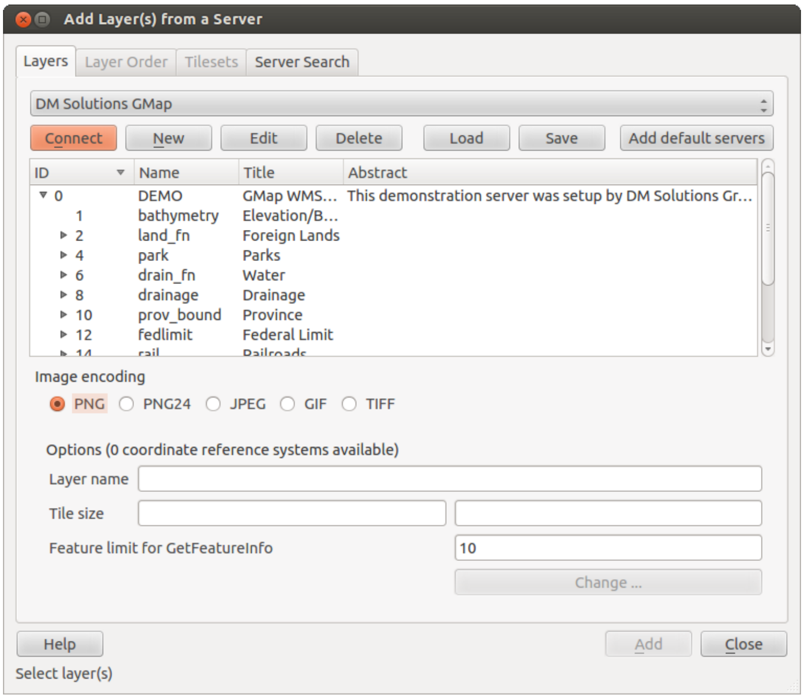
Tip: Image Encoding

You will typically find that a WMS server offers you the choice of JPEG or PNG image encoding. JPEG is a lossy compression format, whereas PNG faithfully reproduces the raw raster data.

Use JPEG if you expect the WMS data to be photographic in nature and/or you don't mind some loss in picture quality. This trade-off typically reduces by 5 times the data transfer requirement compared to PNG.

Use PNG if you want precise representations of the original data, and you don't mind the increased data transfer requirements.

Options



ID	Name	Title	Abstract
0	DEMO	GMap WMS...	This demonstration server was setup by DM Solutions Gr...
1	bathymetry	Elevation/B...	
2	land_fn	Foreign Lands	
4	park	Parks	
6	drain_fn	Water	
8	drainage	Drainage	
10	prov_bound	Province	
12	fedlimit	Federal Limit	
14	rail	Railroads	

Image encoding

● PNG ○ PNG24 ○ JPEG ○ GIF ○ TIFF

Options (0 coordinate reference systems available)

Layer name

Tile size

Feature limit for GetFeatureInfo: 10

Gambar 14.2: Dialog for adding a WMS server, showing its available layers

The Options field provides a text field where you can add a *Layer name* for the WMS-layer. This name will be presented in the legend after loading the layer.

Below the layer name you can define *Tile size*, if you want to set tile sizes (eg. 256x256) to split up the WMS request into multiple requests.

The *Feature limit for GetFeatureInfo* defines what features from the server to query.

If you select a WMS from the list a field with the default projection, provided by the mapserver, appears. If the **[Change...]** button is active, you can click on it and change the default projection of the WMS to another CRS, provided by the WMS server.

Layer Order

The tab *Layer Order* lists the selected layers available from the current connected WMS server. You may notice that some layers are expandable, this means that the layer can be displayed in a choice of image styles.

You can select several layers at once, but only one image style per layer. When several layers are selected, they will be combined at the WMS Server and transmitted to QGIS in one go.

Tip: WMS Layer Ordering

WMS layers rendered by a server are overlaid in the order listed in the Layers section, from top to bottom of the list. If you want to change the overlay order, you can use the tab *Layer Order*.

Transparency

In this version of QGIS, the *Global transparency* setting from the *Layer Properties* is hard-coded to be always on, where available.

Tip: WMS Layer Transparency

The availability of WMS image transparency depends on the image encoding used: PNG and GIF support transparency, whilst JPEG leaves it unsupported.

Coordinate Reference System

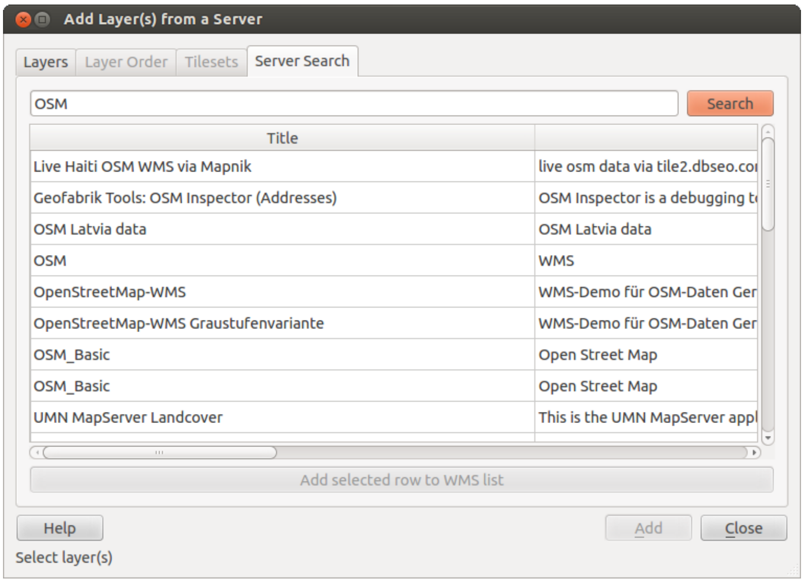
A Coordinate Reference System (CRS) is the OGC terminology for a QGIS Projection.

Each WMS Layer can be presented in multiple CRSs, depending on the capability of the WMS server.

To choose a CRS, select **[Change...]** and a dialog similar to Figure Projection 3 in *Working with Projections* will appear. The main difference with the WMS version of the screen is that only those CRSs supported by the WMS Server will be shown.

Server search

Within QGIS you can search for WMS-servers. Figure_OGC_2 shows the tab *Server Search* with the *Add Layer(s) from a Server* dialog.



OSM

Title	
Live Haiti OSM WMS via Mapnik	live osm data via tile2.dbseo.co
Geofabrik Tools: OSM Inspector (Addresses)	OSM Inspector is a debugging t
OSM Latvia data	OSM Latvia data
OSM	WMS
OpenStreetMap-WMS	WMS-Demo für OSM-Daten Ger
OpenStreetMap-WMS Graustufenvariante	WMS-Demo für OSM-Daten Ger
OSM_Basic	Open Street Map
OSM_Basic	Open Street Map
UMN MapServer Landcover	This is the UMN MapServer appl

Gambar 14.3: Dialog for searching WMS servers after some keywords

As you can see it is possible to enter a search-string in the text field and hit the **[Search]** button. After a short while the search result will be populated into the list below the text field. Browse the result list and inspect your search results within the table. To visualize the results, select a table entry, press the **[Add selected row to WMS-list]** button and change back to the tab *Layers*. QGIS automatically has updated your server list and the selected search result is already enabled in the list of saved WMS-servers in the *Layers* tab. You only need to request the list of layers by clicking the **[Connect]** button. This option is quite handy when you want to search maps by specific keywords.

Basically this option is a frontend to the API of http://geopole.org.

Tilesets

When using WMTS (Cached WMS) Services like

```
http://opencache.statkart.no/gatekeeper/gk/gk.open_wmts?\
  service=WMTS&request=GetCapabilities
```

you are able to browse through the tab *Tilesets* given by the server. Additional information like tile size, formats and supported CRS are listed in this table. In combination with this feature you can use the tile scale slider from the *Settings* → *Panels* (KDE and Windows) or *View* → *Panels* (Gnome and MacOSX) then choose *Tile scale*, which gives you the available scales from the tileserver with nice slider docked in.

Using the Identify Tool

Once you have added a WMS server, and if any layer from a WMS server is queryable, you can then use the Identify tool to select a pixel on the map canvas. A query is made to the WMS server for each selection made. The results of the query are returned in plain text. The formatting of this text is dependent on the particular WMS server used. **Format selection**

If multiple output formats are supported by the server, a combo box with supported formats is automatically added to the identify results dialog and the selected format will is stored in project for the layer. **GML format support**

The Identify tool supports WMS server response (GetFeatureInfo) in GML (it is called Feature in QGIS GUI in this context) format. If "Feature" format is supported by the server and selected, results of the Identify tool are vector features like from regular vector layer. When a single feature is selected in the tree, it is highlighted in the map and it can be copied to clipboard and pasted to another vector layer. See example setup of UMN Mapserver below to support GetFeatureInfo GML format.

```
# in layer METADATA add which fields should be included and define geometry (example):

"gml_include_items"   "all"
"ows_geometries"      "mygeom"
"ows_mygeom_type"     "polygon"

# Then there are two possibilities/formats available, see a) and b):

# a) basic (output is generated by Mapserver and does not contain XSD)
# in WEB METADATA define formats (example):
"wms_getfeatureinfo_formatlist" "application/vnd.ogc.gml,text/html"

# b) using OGR (output is generated by OGR, it is send as multipart and contains XSD)
# in MAP define OUTPUTFORMAT (example):
OUTPUTFORMAT
    NAME "OGRGML"
    MIMETYPE "ogr/gml"
    DRIVER "OGR/GML"
    FORMATOPTION "FORM=multipart"
END

# in WEB METADATA define formats (example):
"wms_getfeatureinfo_formatlist" "OGRGML,text/html"
```

Viewing Properties

Once you have added a WMS server, you can view its properties by right-clicking on it in the legend, and selecting *Properties*. **Metadata Tab**

The tab *Metadata* displays a wealth of information about the WMS server, generally collected from the Capabilities statement returned from that server. Many definitions can be cleaned by reading the WMS standards (see OPEN-GEOSPATIAL-CONSORTIUM *Literatur dan Referensi Web*), but here are a few handy definitions:

- **Server Properties**
  - **WMS Version** — The WMS version supported by the server.
  - **Image Formats** — The list of MIME-types the server can respond with when drawing the map. QGIS supports whatever formats the underlying Qt libraries were built with, which is typically at least `image/png` and `image/jpeg`.
  - **Identity Formats** — The list of MIME-types the server can respond with when you use the Identify tool. Currently QGIS supports the `text-plain` type.
- **Layer Properties**
  - **Selected** — Whether or not this layer was selected when its server was added to this project.

- **Visible** — Whether or not this layer is selected as visible in the legend. (Not yet used in this version of QGIS.)
- **Can Identify** — Whether or not this layer will return any results when the Identify tool is used on it.
- **Can be Transparent** — Whether or not this layer can be rendered with transparency. This version of QGIS will always use transparency if this is `Yes` and the image encoding supports transparency
- **Can Zoom In** — Whether or not this layer can be zoomed in by the server. This version of QGIS assumes all WMS layers have this set to `Yes`. Deficient layers may be rendered strangely.
- **Cascade Count** — WMS servers can act as a proxy to other WMS servers to get the raster data for a layer. This entry shows how many times the request for this layer is forwarded to peer WMS servers for a result.
- **Fixed Width, Fixed Height** — Whether or not this layer has fixed source pixel dimensions. This version of QGIS assumes all WMS layers have this set to nothing. Deficient layers may be rendered strangely.
- **WGS 84 Bounding Box** — The bounding box of the layer, in WGS 84 coordinates. Some WMS servers do not set this correctly (e.g. UTM coordinates are used instead). If this is the case, then the initial view of this layer may be rendered with a very 'zoomed-out' appearance by QGIS. The WMS webmaster should be informed of this error, which they may know as the WMS XML elements `LatLonBoundingBox`, `EX_GeographicBoundingBox` or the CRS:84 `BoundingBox`.
- **Available in CRS** — The projections that this layer can be rendered in by the WMS server. These are listed in the WMS-native format.
- **Available in style** — The image styles that this layer can be rendered in by the WMS server.

WMS Client Limitations

Not all possible WMS Client functionality had been included in this version of QGIS. Some of the more notable exceptions follow.

Editing WMS Layer Settings

Once you've completed the Add WMS layer procedure, there is no ability to change the settings. A workaround is to delete the layer completely and start again.

WMS Servers Requiring Authentication

Currently public accessible and secured WMS-services are supported. The secured WMS-servers can be accessed by public authentication. You can add the (optional) credentials when you add a WMS-server. See section *Selecting WMS/WMTS Servers* for details.

Tip: Accessing secured OGC-layers

If you need to access secured layers with other secured methods than basic authentication, you could use InteProxy as a transparent proxy, which does support several authentication methods. More information can be found at the InteProxy manual found on the website http://inteproxy.wald.intevation.org.

Tip: |qg| WMS Mapserver

From Version 1.7.0 QGIS has its own implementation of a WMS 1.3.0 Mapserver. Read more about this at chapter *QGIS as OGC Data Server*.

14.1.2 WCS Client

A Web Coverage Service (WCS) provides access to raster data in forms that are useful for client-side rendering, as input into scientific models, and for other clients. The WCS may be compared to the WFS and the WMS.

As WMS and WFS service instances, a WCS allows clients to choose portions of a server's information holdings based on spatial constraints and other query criteria.

QGIS has a native WCS provider and supports both version 1.0 and 1.1 (which are significantly different), but currently it prefers 1.0, because 1.1 has many issues, each server implements it in different way with various particularities.

The native WCS provider handles all network requests and uses all standard QGIS network settings (especially proxy). It is also possible select cache mode (always cache, prefer cache, prefer network, always network) and the provider also supports selection of time position if temporal domain is offered by server.

14.1.3 WFS and WFS-T Client

In QGIS, a WFS layer behaves pretty much like any other vector layer. You can identify and select features and view the attribute table. Since QGIS 1.6 editing (WFS-T) is also supported.

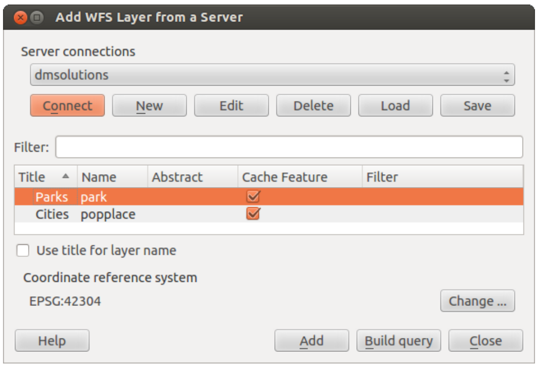
In general adding a WFS layer is very similar to the procedure used with WMS. The difference is there are no default servers defined, so we have to add our own.

Loading a WFS Layer

As an example we use the DM Solutions WFS server and display a layer. The URL is: http://www2.dmsolutions.ca/cgi-bin/mswfs_gmap

1. Click on the Add WFS Layer tool on the Layers toolbar, the dialog *Add WFS Layer from a Server* appears
2. Click on **[New]**
3. Enter 'DM Solutions' as name
4. Enter the URL (see above)
5. Click **[OK]**
6. Choose 'DM Solutions' from the dropdown list *Server Connections*
7. Click **[Connect]**
8. Wait for the list of layers to be populated
9. Select the *Parks* layer in the list
10. Click **[Apply]** to add the layer to the map

Note that proxy settings you have set in your preferences are also recognized.



Server connections: dmsolutions

Filter:

Title	Name	Abstract	Cache Feature	Filter
Parks	park		☑	
Cities	popplace		☑	

☐ Use title for layer name

Coordinate reference system
EPSG:42304

Gambar 14.4: Adding a WFS layer

You'll notice the download progress is visualized in the left bottom of the QGIS main window. Once the layer is loaded, you can identify and select a province or two and view the attribute table.

Only WFS 1.0.0 is supported. At this point there have not been many tests against WFS versions implemented in other WFS-servers. If you encounter problems with any other WFS-server, please do not hesitate to contact the development team. Please refer to Section *Bantuan dan Dukungan* for further information about the mailinglists.

Tip: Finding WFS Servers

You can find additional WFS servers by using Google or your favorite search engine. There are a number of lists with public URLs, some of them maintained and some not.

14.2 QGIS as OGC Data Server

QGIS Server is an open source WMS 1.3 and WFS 1.0.0 implementation which, in addition, implements advanced cartographic features for thematic mapping. The QGIS Server is a FastCGI/CGI (Common Gateway Interface) application written in C++ that works together with a webserver (e.g. Apache, Lighttpd). It is funded by the EU projects Orchestra, Sany and the city of Uster in Switzerland.

It uses QGIS as backend for the GIS logic and for map rendering. Furthermore the Qt library is used for graphics and for platform independent C++ programming. In contrast to other WMS software, the QGIS Server uses cartographic rules as a configuration language, both for the server configuration and for the user-defined cartographic rules.

Moreover, the QGIS Server project provides the 'Publish to Web' plugin, a plugin for QGIS desktop which exports the current layers and symbology as a web project for QGIS Server (containing cartographic visualization rules expressed in SLD).

As QGIS desktop and QGIS Server use the same visualization libraries, the maps that are published on the web look the same as in desktop GIS. The 'Publish to Web' plugin currently supports basic symbolization, with more complex cartographic visualization rules introduced manually. As the configuration is performed with the SLD standard and its documented extensions, there is only one standardised language to learn, which greatly simplifies the complexity of creating maps for the Web.

In one of the following manuals we will provide a sample configuration to set up a QGIS Server. But for now we recommend to read one of the following URLs to get more information:

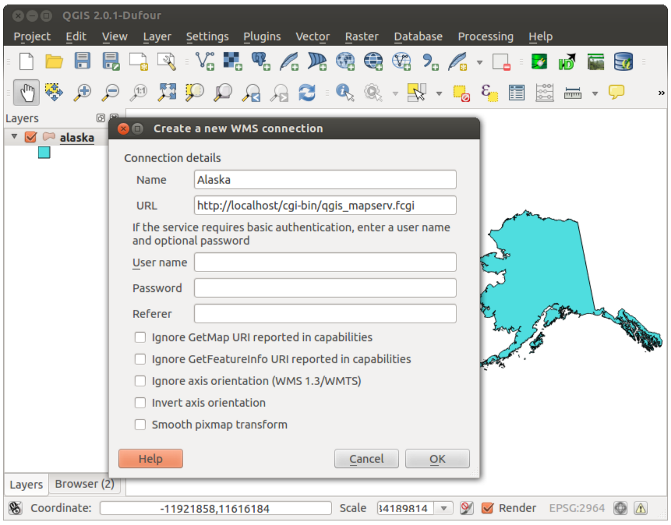
- http://karlinapp.ethz.ch/qgis_wms/
- http://hub.qgis.org/projects/quantum-gis/wiki/QGIS_Server_Tutorial
- http://linfiniti.com/2010/08/qgis-mapserver-a-wms-server-for-the-masses/

14.2.1 Sample installation on Debian Squeeze

At this point we will give a short and simple sample installation howto for Debian Squeeze. Many other OS provide packages for QGIS Server, too. If you have to build it all from source, please refer to the URLs above.

Apart from QGIS and QGIS Server you need a webserver, in our case apache2. You can install all packages with aptitude or apt-get install together with other necessary dependency packages. After installation you should test, if the webserver and QGIS Server works as expected. Make sure the apache server is running with `/etc/init.d/apache2 start`. Open a web browser and type URL: `http://localhost`. If apache is up, you should see the message 'It works!'.

Now we test the QGIS Server installation. The `qgis_mapserv.fcgi` is available at `/usr/lib/cgi-bin/qgis_mapserv.fcgi` and provides a standard wms that shows the state boundaries of Alaska. Add the WMS with the URL `http://localhost/cgi-bin/qgis_mapserv.fcgi` as described in *Selecting WMS/WMTS Servers*.


QGIS 2.0.1-Dufour
Project Edit View Layer Settings Plugins Vector Raster Database Processing Help
Layers
alaska
Layers Browser (2)
Help Cancel OK
Render

Create a new WMS connection

Connection details

Name: Alaska

URL: http://localhost/cgi-bin/qgis_mapserv.fcgi

If the service requires basic authentication, enter a user name and optional password

User name:

Password:

Referer:

☐ Ignore GetMap URI reported in capabilities

☐ Ignore GetFeatureInfo URI reported in capabilities

☐ Ignore axis orientation (WMS 1.3/WMTS)

☐ Invert axis orientation

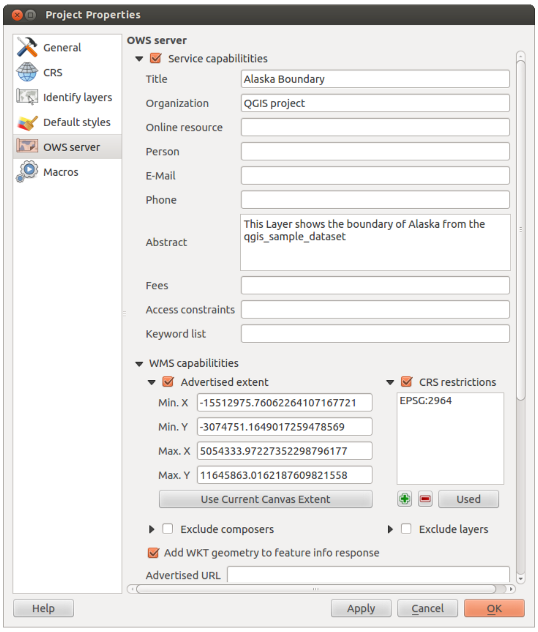
☐ Smooth pixmap transform

Coordinate: -11921858,11616184 Scale 1:4189814 EPSG:2964

Gambar 14.5: Standard WMS with USA boundaries included in the QGIS Server (KDE)

14.2.2 Creating a WMS/WFS from a QGIS project

To provide a new QGIS Server WMS or WFS we have to create a QGIS project file with some data. Here we use the 'alaska' shapefile from the QGIS sample dataset. Define the colors and styles of the layers in QGIS and define the project CRS, if not already done.


Project Properties
General
CRS
Identify layers
Default styles
OWS server
Macros
Use Current Canvas Extent
Used
Help Apply Cancel OK

OWS server

☑ Service capabilitities

Title: Alaska Boundary

Organization: QGIS project

Online resource:

Person:

E-Mail:

Phone:

Abstract: This Layer shows the boundary of Alaska from the qgis_sample_dataset

Fees:

Access constraints:

Keyword list:

WMS capabilitities

☑ Advertised extent

Min. X: -15512975.76062264107167721

Min. Y: -3074751.1649017259478569

Max. X: 5054333.97227352298796177

Max. Y: 11645863.0162187609821558

☑ CRS restrictions

EPSG:2964

☐ Exclude composers

☐ Exclude layers

☑ Add WKT geometry to feature info response

Advertised URL:

Gambar 14.6: Definitions for a QGIS Server WMS/WFS project (KDE)

Then go to the *OWS Server* menu of the *Project* → *Project Properties* dialog and give some information about the OWS in the fields under *Service Capabilities*. This will appear in the GetCapabilities response of the WMS or WFS. If you don't check ☑ *Service capabilities* QGIS Server will use the information given in the `wms_metadata.xml` file located in the `cgi-bin` folder.

In the *WMS capabilities* section you can define the extent advertised in the WMS GetCapabilities response by entering the minimum and maximum X and Y values in the fields under *Advertised extent*. Clicking *Use Current Canvas Extent* sets these values to the extent currently displayed in the QGIS map canvas. By checking ☑ *CRS restrictions* you can restrict in which coordinate reference systems (CRS) QGIS Server will offer to render maps.

Use the ➕ button below to select those CRS from the Coordinate Reference System Selector, or click *Used* to add the CRS used in the QGIS project to the list.

If you have print composers defined in your project they will be listed in the GetCapabilities response, and they can be used by the GetPrint request to create prints, using one of the print composer layouts as a template. This is a QGIS specific extension to the WMS 1.3.0 specification. If you want to exclude any print composer from being published by the WMS, check ☑ *Exclude composers* and click the ➕ button below. Then select a print composer from the *Select print composer* dialog in order to add it to the excluded composers list.

If you want to exclude any layer or layer group from being published by the WMS, check ☑ *Exclude Layers* and click the ➕ button below. This opens the *Select restricted layers and groups* dialog which allows you to choose the layers and groups that you don't want to be published. Use the shift or control key if you want to select multiple entries at once.

If you wish you can check ☑ *Add WKT geometry to feature info response*. This will include in the GetFeatureInfo response the geometries of the features in a text format. If you want QGIS Server to advertise specific request URLs in the WMS GetCapabilities response, enter the corresponding URL in the *Advertised URL* field. Furthermore you can restrict the maximum size of the maps returned by the GetMap request by entering the maximum width and height into the respective fields under *Maximums for GetMap request*.

In the *WFS capabilities* area you can select the layers that you want to provide as WFS, and specify if they will allow the update, insert and delete operations. If you enter a URL in the *Advertised URL* field of the *WFS capabilities* section, QGIS Server will advertise this specific URL in the WFS GetCapabilities response.

Now save the session in a project file `alaska.qgs`. To provide the project as a WMS/WFS, we create a new folder `/usr/lib/cgi-bin/project` with admin privileges and add the project file `alaska.qgs` and a copy of the `qgis_mapserv.fcgi` file - that's all.

Now we test our project WMS and WFS, add the WMS and WFS as described in *Loading WMS/WMTS Layers* and *WFS and WFS-T Client* to QGIS and load the WMS. The URL is:

```
http://localhost/cgi-bin/project/qgis_mapserv.fcgi
```

Fine tuning your OWS

For vector layers, the *Fields* menu of the *Layer → Properties* dialog allows you to define for each attribute if it will be published or not. By default all the attributes are published by your WMS and WFS. If you want a specific attribute not to be published, uncheck the corresponding check box in the *WMS* or *WFS* column.

You can overlay watermarks over the maps produced by your WMS by adding text annotations or SVG annotations to the project file. See *sec_annotations* for instructions on creating annotations. For annotations to be displayed as watermarks on the WMS output, the *Fixed map position* check box in the *Annotation text* dialog must be unchecked. This can be accessed by double clicking the annotation while one of the annotation tools is active. For SVG annotations you will either need to set the project to save absolute paths (in the *General* menu of the *Project → Project Properties* dialog) or to manually modify the path to the SVG image in a way that it represents a valid relative path.

Extra parameters supported by the WMS GetMap request

In the WMS GetMap request QGIS Server accepts a couple of extra parameters in addition to the standard parameters according to the OCG WMS 1.3.0 specification:

- **MAP** parameter: Similar to MapServer, the `MAP` parameter can be used to specify the path to the QGIS project file. You can specify an absolute path or a path relative to the location of the server executable (`qgis_mapserv.fcgi`). If not specified, QGIS Server searches for .qgs files in the directory where the server executable is located.

  Example:

```
http://localhost/cgi-bin/qgis_mapserv.fcgi?\
  REQUEST=GetMap&MAP=/home/qgis/mymap.qgs&...
```

- **DPI** parameter: The `DPI` parameter can be used to specify the requested output resolution.

  Example:

  ```
  http://localhost/cgi-bin/qgis_mapserv.fcgi?REQUEST=GetMap&DPI=300&...
  ```

- **OPACITIES** parameter: Opacity can be set on layer or group level. Allowed values range from 0 (fully transparent) to 255 (fully opaque).

  Example:

  ```
  http://localhost/cgi-bin/qgis_mapserv.fcgi?\
    REQUEST=GetMap&LAYERS=mylayer1,mylayer2&OPACITIES=125,200&...
  ```

BAB 15

Pekerjaan dengan Data GPS

15.1 GPS Plugin

15.1.1 What is GPS?

GPS, the Global Positioning System, is a satellite-based system that allows anyone with a GPS receiver to find their exact position anywhere in the world. It is used as an aid in navigation, for example in airplanes, in boats and by hikers. The GPS receiver uses the signals from the satellites to calculate its latitude, longitude and (sometimes) elevation. Most receivers also have the capability to store locations (known as **waypoints**), sequences of locations that make up a planned **route** and a tracklog or **track** of the receivers movement over time. Waypoints, routes and tracks are the three basic feature types in GPS data. QGIS displays waypoints in point layers while routes and tracks are displayed in linestring layers.

15.1.2 Loading GPS data from a file

There are dozens of different file formats for storing GPS data. The format that QGIS uses is called GPX (GPS eXchange format), which is a standard interchange format that can contain any number of waypoints, routes and tracks in the same file.

To load a GPX file you first need to load the plugin. *Plugins* → *Plugin Manager...* opens the Plugin Manager Dialog. Activate the ☑ *GPS Tools* checkbox. When this plugin is loaded two buttons with a small handheld GPS device will show up in the toolbar:

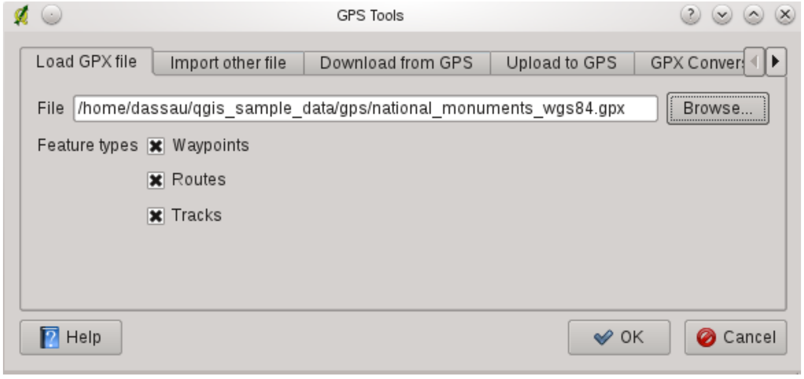
- Create new GPX Layer
- GPS Tools

For working with GPS data we provide an example GPX file available in the QGIS sample dataset: `qgis_sample_data/gps/national_monuments.gpx`. See Section *Contoh data* for more information about the sample data.

1. Select *Vector* → *GPS* → *GPS Tools* or click the GPS Tools icon in the toolbar and open the *Load GPX file* tab (see figure_GPS_1).
2. Browse to the folder `qgis_sample_data/gps/`, select the GPX file `national_monuments.gpx` and click **[Open]**.

Use the **[Browse...]** button to select the GPX file, then use the checkboxes to select the feature types you want to load from that GPX file. Each feature type will be loaded in a separate layer when you click **[OK]**. The file `national_monuments.gpx` only includes waypoints.

Catatan: GPS units allow to store data in different coordinate systems. When downloading a GPX file (from your GPS unit or a web site) and then loading it in QGIS, be sure that the data stored in the



File /home/dassau/qgis_sample_data/gps/national_monuments_wgs84.gpx

Feature types ☒ Waypoints

☒ Routes

☒ Tracks

Gambar 15.1: The *GPS Tools* dialog window

GPX file uses WGS84 (latitude/longitude). QGIS expects this and it is the official GPX specification. See http://www.topografix.com/GPX/1/1/

15.1.3 GPSBabel

Since QGIS uses GPX files you need a way to convert other GPS file formats to GPX. This can be done for many formats using the free program GPSBabel, which is available at http://www.gpsbabel.org. This program can also transfer GPS data between your computer and a GPS device. QGIS uses GPSBabel to do these things, so it is recommended that you install it. However, if you just want to load GPS data from GPX files you will not need it. Version 1.2.3 of GPSBabel is known to work with QGIS, but you should be able to use later versions without any problems.

15.1.4 Importing GPS data

To import GPS data from a file that is not a GPX file, you use the tool *Import other file* in the GPS Tools dialog. Here you select the file that you want to import (and the file type), which feature type you want to import from it, where you want to store the converted GPX file and what the name of the new layer should be. Note that not all GPS data formats will support all three feature types, so for many formats you will only be able to choose between one or two types.

15.1.5 Downloading GPS data from a device

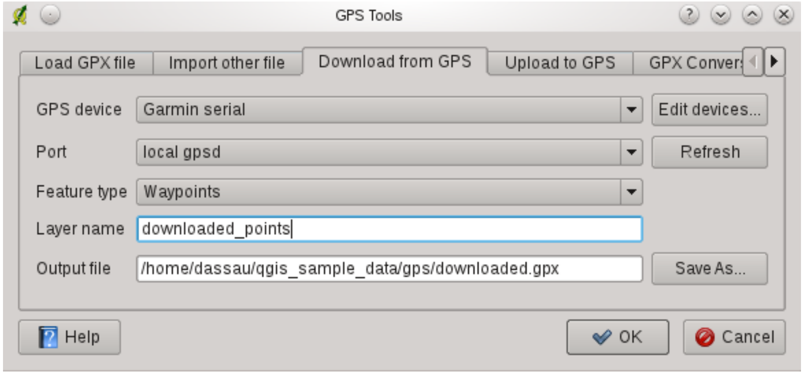
QGIS can use GPSBabel to download data from a GPS device directly as new vector layers. For this we use the *Download from GPS* tab of the GPS Tools dialog (see Figure_GPS_2). Here, we select the type of GPS device, the port that it is connected to (or usb if your GPS supports this), the feature type that you want to download, the GPX file where the data should be stored, and the name of the new layer.

The device type you select in the GPS device menu determines how GPSBabel tries to communicate with your GPS device. If none of the available types work with your GPS device you can create a new type (see section *Defining new device types*).

The port may be a file name or some other name that your operating system uses as a reference to the physical port in your computer that the GPS device is connected to. It may also be simply usb, for usb enabled GPS units.

- On Linux this is something like `/dev/ttyS0` or `/dev/ttyS1`
- On Windows it is `COM1` or `COM2`

When you click **[OK]** the data will be downloaded from the device and appear as a layer in QGIS.



GPS device: Garmin serial

Port: local gpsd

Feature type: Waypoints

Layer name: downloaded_points

Output file: /home/dassau/qgis_sample_data/gps/downloaded.gpx

Gambar 15.2: The download tool

15.1.6 Uploading GPS data to a device

You can also upload data directly from a vector layer in QGIS to a GPS device using the *Upload to GPS* tab of the GPS Tools dialog. To do this you simply select the layer that you want to upload (which must be a GPX layer), your GPS device type, and the port (or usb) that it is connected to. Just as with the download tool you can specify new device types if your device isn't in the list.

This tool is very useful in combination with the vector editing capabilities of QGIS. It allows you to load a map, create waypoints and routes, and then upload them and use them on your GPS device.

15.1.7 Defining new device types

There are lots of different types of GPS devices. The QGIS developers can't test all of them, so if you have one that does not work with any of the device types listed in the *Download from GPS* and *Upload to GPS* tools you can define your own device type for it. You do this by using the GPS device editor, which you start by clicking the **[Edit devices]** button in the download or the upload tabs.

To define a new device you simply click the **[New device]** button, enter a name, a download command and an upload command for your device, and click the **[Update device]** button. The name will be listed in the device menus in the upload and download windows, and can be any string. The download command is the command that is used to download data from the device to a GPX file. This will probably be a GPSBabel command, but you can use any other command line program that can create a GPX file. QGIS will replace the keywords `%type`, `%in`, and `%out` when it runs the command.

`%type` will be replaced by `-w` if you are downloading waypoints, `-r` if you are downloading routes and `-t` if you are downloading tracks. These are command line options that tell GPSBabel which feature type to download.

`%in` will be replaced by the port name that you choose in the download window and `%out` will be replaced by the name you choose for the GPX file that the downloaded data should be stored in. So if you create a device type with the download command `gpsbabel %type -i garmin -o gpx %in %out` (this is actually the download command for the predefined device type 'Garmin serial') and then use it to download waypoints from port `/dev/ttyS0` to the file `output.gpx`, QGIS will replace the keywords and run the command `gpsbabel -w -i garmin -o gpx /dev/ttyS0 output.gpx`.

The upload command is the command that is used to upload data to the device. The same keywords are used, but `%in` is now replaced by the name of the GPX file for the layer that is being uploaded, and `%out` is replaced by the port name.

You can learn more about GPSBabel and it's available command line options at http://www.gpsbabel.org.

Once you have created a new device type it will appear in the device lists for the download and upload tools.

15.2 Live GPS tracking

To activate Live GPS tracking in QGIS you need to select *Settings* → *Panels* ☑ *GPS information*. You will get a new docked window on the left side of the canvas.

There are 4 possible screens in this GPS tracking window:

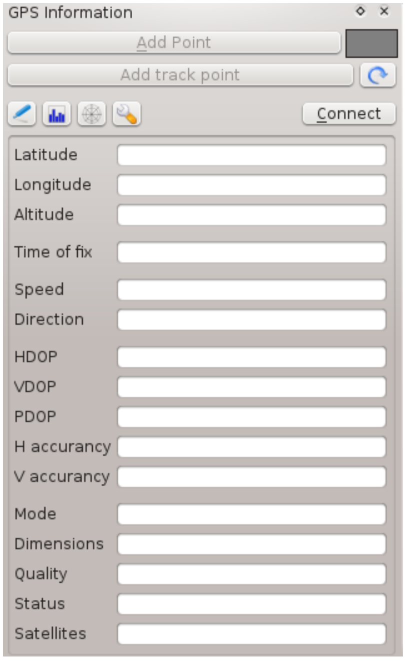
- GPS position coordinates and for manually entering Vertices and Features.
- GPS signal strength of satellite connections.
- GPS polar screen showing number and polar position of satellites.
- GPS options screen (see figure_gps_options).

With a plugged in GPS receiver (has to be supported by your operating system) a simple click on **[Connect]** connects the GPS to QGIS. A second click (now on **[Disconnect]**) disconnects the GPS-receiver from your computer. For GNU/Linux gpsd support is integrated to support connection to most GPS receivers. Therefore you first have to configure gpsd properly to connect QGIS to it.

> **Peringatan:** If you want to record your position to the canvas you have to create a new vector layer first and switch it to editable status to be able to record your track.

15.2.1 Position and additional attributes

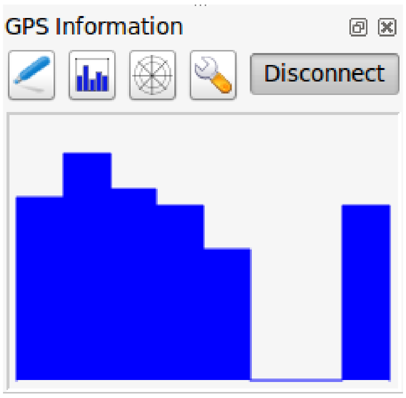
If the GPS is receiving signals from satellites you will see your position in latitude, longitude and altitude together with additional attributes.


GPS Information
Add Point
Add track point
Connect
Latitude
Longitude
Altitude
Time of fix
Speed
Direction
HDOP
VDOP
PDOP
H accurancy
V accurancy
Mode
Dimensions
Quality
Status
Satellites

Gambar 15.3: GPS tracking position and additional attributes

15.2.2 GPS signal strength

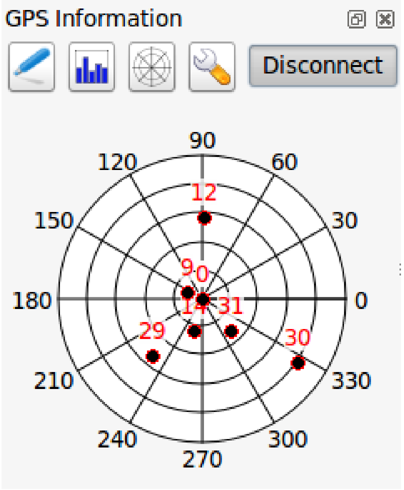
Here you can see the signal strenght of the satellites you are receiving signals from.


GPS Information
Disconnect

Gambar 15.4: GPS tracking signal strength

15.2.3 GPS polar window

If you want to know where in the sky all the connected satellites are, you have to switch to the polar screen. You can also see the ID numbers of the satellites you are receiving signals from.

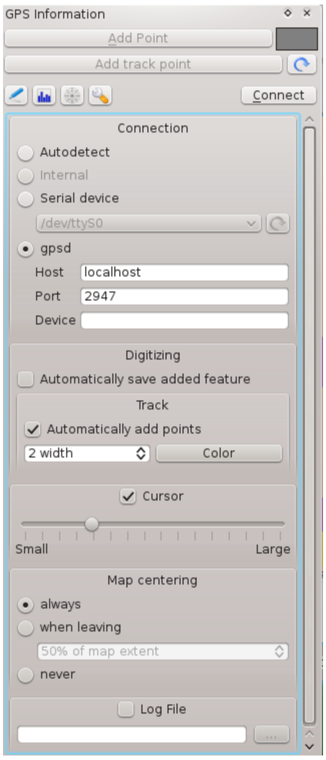

GPS Information
Disconnect
90
60
30
0
330
300
270
240
210
180
150
120
12
9
0
14
31
29
30

Gambar 15.5: GPS tracking polar window

15.2.4 GPS options

In case of connection problems you can switch between:

- ● *Autodetect*
- ○ *Internal*
- ○ *Serial device*
- ○ *gpsd* (selecting Host, Port and Device your GPS is connected to)



Connection

○ Autodetect

○ Internal

○ Serial device

/dev/ttyS0

● gpsd

Host: localhost

Port: 2947

Device:

Digitizing

☐ Automatically save added feature

Track

☑ Automatically add points

2 width

Color

☑ Cursor

Small

Large

Map centering

● always

○ when leaving

50% of map extent

○ never

☐ Log File

Gambar 15.6: GPS tracking options window

A click on **[Connect]** again initiates the connection to the GPS receiver.

You can activate ☑ *Automatically save added features* when you are in editing mode. Or you can can activate ☑ *Automatically add points* to the map canvas with a certain width and color.

Activating ☑ *Cursor* you can use a slider to shrink and grow the position cursor on the canvas.

Activating ● *Map centering* allows to decide in which way the canvas will be updated. This includes 'always', 'when leaving' if your recorded coordinates start either to move out of canvas or 'never' to keep map extent.

Finally you can activate ☑ *Log file* and define a path and a file where log messages about the gps tracking a logged.

If you want to set a feature manually you have to go back to Position and click on **[Add Point]** or **[Add track point]**.

BAB 16

GRASS GIS Integration

The GRASS plugin provides access to GRASS GIS (see GRASS-PROJECT *Literatur dan Referensi Web*) databases and functionalities. This includes visualization of GRASS raster and vector layers, digitizing vector layers, editing vector attributes, creating new vector layers and analysing GRASS 2D and 3D data with more than 400 GRASS modules.

In this Section we'll introduce the plugin functionalities and give some examples on managing and working with GRASS data. Following main features are provided with the toolbar menu, when you start the GRASS plugin, as described in section *sec_starting_grass* :

- Open mapset
- New mapset
- Close mapset
- Add GRASS vector layer
- Add GRASS raster layer
- Create new GRASS vector
- Edit GRASS vector layer
- Open GRASS tools
- Display current GRASS region
- Edit current GRASS region

16.1 Starting the GRASS plugin

To use GRASS functionalities and/or visualize GRASS vector and raster layers in QGIS, you must select and load the GRASS plugin with the Plugin Manager. Therefore go to the menu *Plugins* → *Manage Plugins*, select ☑ *GRASS* and click **[OK]**.

You can now start loading raster and vector layers from an existing GRASS `LOCATION` (see section *sec_load_grassdata*). Or you create a new GRASS `LOCATION` with QGIS (see section *Creating a new GRASS LOCATION*) and import some raster and vector data (see Section *Importing data into a GRASS LOCATION*) for further analysis with the GRASS Toolbox (see section *The GRASS toolbox*).

16.2 Loading GRASS raster and vector layers

With the GRASS plugin, you can load vector or raster layers using the appropriate button on the toolbar menu. As an example we use the QGIS alaska dataset (see Section *Contoh data*). It includes a small sample GRASS `LOCATION` with 3 vector layers and 1 raster elevation map.

1. Create a new folder `grassdata`, download the QGIS 'Alaska' dataset `qgis_sample_data.zip` from http://download.osgeo.org/qgis/data/ and unzip the file into `grassdata`.
2. Start QGIS.
3. If not already done in a previous QGIS session, load the GRASS plugin clicking on *Plugins* → *Manage Plugins* and activate ☑ *GRASS*. The GRASS toolbar appears in the QGIS main window.
4. In the GRASS toolbar, click the Open mapset icon to bring up the *MAPSET* wizard.
5. For `Gisdbase` browse and select or enter the path to the newly created folder `grassdata`.
6. You should now be able to select the *LOCATION* `alaska` and the *MAPSET* `demo`.
7. Click **[OK]**. Notice that some previously disabled tools in the GRASS toolbar are now enabled.
8. Click on Add GRASS raster layer, choose the map name `gtopo30` and click **[OK]**. The elevation layer will be visualized.
9. Click on Add GRASS vector layer, choose the map name `alaska` and click **[OK]**. The Alaska boundary vector layer will be overlayed on top of the `gtopo30` map. You can now adapt the layer properties as described in chapter *The Vector Properties Dialog*, e.g. change opacity, fill and outline color.
10. Also load the other two vector layers `rivers` and `airports` and adapt their properties.

As you see, it is very simple to load GRASS raster and vector layers in QGIS. See following sections for editing GRASS data and creating a new `LOCATION`. More sample GRASS `LOCATIONs` are available at the GRASS website at http://grass.osgeo.org/download/sample-data/.

Tip: GRASS Data Loading

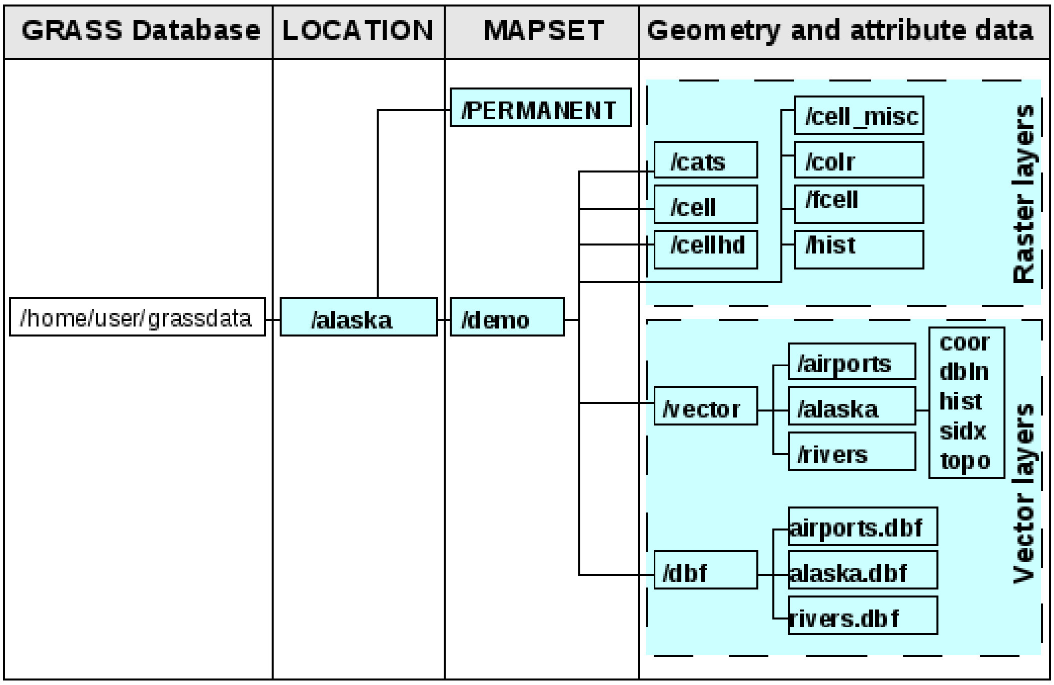
If you have problems loading data or QGIS terminates abnormally, check to make sure you have loaded the GRASS plugin properly as described in section *sec_starting_grass*.

16.3 GRASS LOCATION and MAPSET

GRASS data are stored in a directory referred to as GISDBASE. This directory often called `grassdata`, must be created before you start working with the GRASS plugin in QGIS. Within this directory, the GRASS GIS data are organized by projects stored in subdirectories called `LOCATION`. Each `LOCATION` is defined by its coordinate system, map projection and geographical boundaries. Each `LOCATION` can have several `MAPSETs` (subdirectories of the `LOCATION`) that are used to subdivide the project into different topics, subregions, or as workspaces for individual team members (Neteler & Mitasova 2008 *Literatur dan Referensi Web*). In order to analyze vector and raster layers with GRASS modules, you must import them into a GRASS `LOCATION` (This is not strictly true - with the GRASS modules `r.external` and `v.external` you can create read-only links to external GDAL/OGR-supported data sets without importing them. But because this is not the usual way for beginners to work with GRASS, this functionality will not be described here.).

16.3.1 Creating a new GRASS LOCATION

As an example here is how the sample GRASS `LOCATION alaska`, which is projected in Albers Equal Area projection with unit feet was created for the QGIS sample dataset. This sample GRASS `LOCATION alaska`


GRASS Database
LOCATION
MAPSET
Geometry and attribute data
/home/user/grassdata
/alaska
/PERMANENT
/demo
/cats
/cell
/cellhd
/cell_misc
/colr
/fcell
/hist
Raster layers
/vector
/airports
/alaska
/rivers
coor
dbln
hist
sidx
topo
/dbf
airports.dbf
alaska.dbf
rivers.dbf
Vector layers

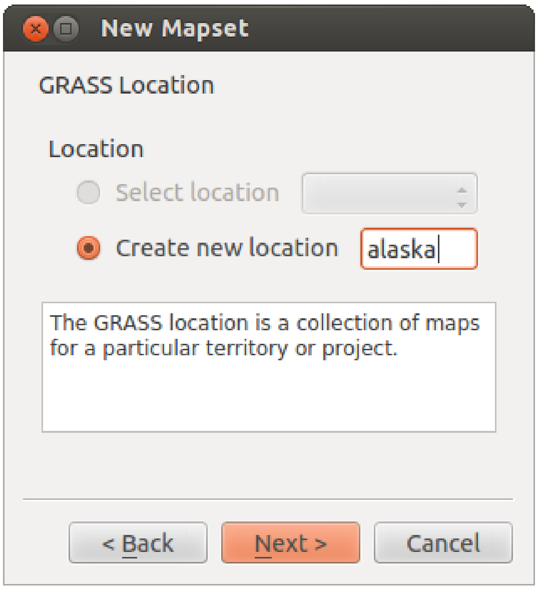
Gambar 16.1: GRASS data in the alaska LOCATION

will be used for all examples and exercises in the following GRASS GIS related chapters. It is useful to download and install the dataset on your computer *Contoh data*).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. Visualize the `alaska.shp` shapefile (see Section *vector_load_shapefile*) from the QGIS alaska dataset *Contoh data*.
3. In the GRASS toolbar, click on the New mapset icon to bring up the *MAPSET* wizard.
4. Select an existing GRASS database (GISDBASE) folder `grassdata` or create one for the new `LOCATION` using a file manager on your computer. Then click **[Next]**.
5. We can use this wizard to create a new `MAPSET` within an existing `LOCATION` (see section *Adding a new MAPSET*) or to create a new `LOCATION` altogether. Select ● *Create new location* (see figure_grass_location_2).
6. Enter a name for the `LOCATION` - we used 'alaska' and click **[Next]**.
7. Define the projection by clicking on the radio button ● *Projection* to enable the projection list.
8. We are using Albers Equal Area Alaska (feet) projection. Since we happen to know that it is represented by the EPSG ID 2964, we enter it in the search box. (Note: If you want to repeat this process for another `LOCATION` and projection and haven't memorized the EPSG ID, click on the CRS Status icon in the lower right-hand corner of the status bar (see Section *Working with Projections*)).
9. In *Filter* insert 2964 to select the projection.
10. Click **[Next]**.
11. To define the default region, we have to enter the `LOCATION` bounds in north, south, east, and west direction. Here we simply click on the button **[Set current QGIS extent]**, to apply the extend of the loaded layer `alaska.shp` as the GRASS default region extend.
12. Click **[Next]**.
13. We also need to define a `MAPSET` within our new `LOCATION`. You can name it whatever you like - we used 'demo' (when creating a new `LOCATION`). GRASS automatically creates a special `MAPSET` called

`PERMANENT` designed to store the core data for the project, its default spatial extend and coordinate system definitions (Neteler & Mitasova 2008 *Literatur dan Referensi Web*).

14. Check out the summary to make sure it's correct and click **[Finish]**.
15. The new `LOCATION` 'alaska' and two `MAPSETs` 'demo' and 'PERMANENT' are created. The currently opened working set is 'demo', as you defined.
16. Notice that some of the tools in the GRASS toolbar that were disabled are now enabled.



The GRASS location is a collection of maps for a particular territory or project.

Gambar 16.2: Creating a new GRASS LOCATION or a new MAPSET in QGIS

If that seemed like a lot of steps, it's really not all that bad and a very quick way to create a `LOCATION`. The `LOCATION` 'alaska' is now ready for data import (see section *Importing data into a GRASS LOCATION*). You can also use the already existing vector and raster data in the sample GRASS `LOCATION` 'alaska' included in the QGIS 'Alaska' dataset *Contoh data* and move on to Section *The GRASS vector data model*.

16.3.2 Adding a new MAPSET

A user has only write access to a GRASS `MAPSET` he created. This means that besides access to his own `MAPSET`, each user can read maps in other user's `MAPSETs`, but he can modify or remove only the maps in his own `MAPSET`.

All `MAPSETs` include a `WIND` file that stores the current boundary coordinate values and the currently selected raster resolution (Neteler & Mitasova 2008 *Literatur dan Referensi Web*, see Section *The GRASS region tool*).

1. Start QGIS and make sure the GRASS plugin is loaded.
2. In the GRASS toolbar, click on the New mapset icon to bring up the *MAPSET* wizard.
3. Select the GRASS database (GISDBASE) folder `grassdata` with the `LOCATION` 'alaska', where we want to add a further `MAPSET`, called 'test'.
4. Click **[Next]**.
5. We can use this wizard to create a new `MAPSET` within an existing `LOCATION` or to create a new `LOCATION` altogether. Click on the radio button ● *Select location* (see figure_grass_location_2) and click **[Next]**.
6. Enter the name `text` for the new `MAPSET`. Below in the wizard you see a list of existing `MAPSETs` and its owners.
7. Click **[Next]**, check out the summary to make sure it's all correct and click **[Finish]**.

16.4 Importing data into a GRASS LOCATION

This Section gives an example how to import raster and vector data into the 'alaska' GRASS `LOCATION` provided by the QGIS 'Alaska' dataset. Therefore we use a landcover raster map `landcover.img` and a vector GML file `lakes.gml` from the QGIS 'Alaska' dataset *Contoh data*.

1. Start QGIS and make sure the GRASS plugin is loaded.
2. In the GRASS toolbar, click the Open MAPSET icon to bring up the *MAPSET* wizard.
3. Select as GRASS database the folder `grassdata` in the QGIS alaska dataset, as `LOCATION` 'alaska', as `MAPSET` 'demo' and click **[OK]**.
4. Now click the Open GRASS tools icon. The GRASS Toolbox (see section *The GRASS toolbox*) dialog appears.
5. To import the raster map `landcover.img`, click the module `r.in.gdal` in the *Modules Tree* tab. This GRASS module allows to import GDAL supported raster files into a GRASS `LOCATION`. The module dialog for `r.in.gdal` appears.
6. Browse to the folder `raster` in the QGIS 'Alaska' dataset and select the file `landcover.img`.
7. As raster output name define `landcover_grass` and click **[Run]**. In the *Output* tab you see the currently running GRASS command `r.in.gdal -o input=/path/to/landcover.img output=landcover_grass`.
8. When it says **Succesfully finished** click **[View output]**. The `landcover_grass` raster layer is now imported into GRASS and will be visualized in the QGIS canvas.
9. To import the vector GML file `lakes.gml`, click the module `v.in.ogr` in the *Modules Tree* tab. This GRASS module allows to import OGR supported vector files into a GRASS `LOCATION`. The module dialog for `v.in.ogr` appears.
10. Browse to the folder `gml` in the QGIS 'Alaska' dataset and select the file `lakes.gml` as OGR file.
11. As vector output name define `lakes_grass` and click **[Run]**. You don't have to care about the other options in this example. In the *Output* tab you see the currently running GRASS command `v.in.ogr -o dsn=/path/to/lakes.gml output=lakes\_grass`.
12. When it says **Succesfully finished** click **[View output]**. The `lakes_grass` vector layer is now imported into GRASS and will be visualized in the QGIS canvas.

16.5 The GRASS vector data model

It is important to understand the GRASS vector data model prior to digitizing.

In general, GRASS uses a topological vector model.

This means that areas are not represented as closed polygons, but by one or more boundaries. A boundary between two adjacent areas is digitized only once, and it is shared by both areas. Boundaries must be connected and closed without gaps. An area is identified (and labeled) by the **centroid** of the area.

Besides boundaries and centroids, a vector map can also contain points and lines. All these geometry elements can be mixed in one vector and will be represented in different so called 'layers' inside one GRASS vector map. So in GRASS a layer is not a vector or raster map but a level inside a vector layer. This is important to distinguish carefully (Although it is possible to mix geometry elements, it is unusual and even in GRASS only used in special cases such as vector network analysis. Normally you should prefere to store different geometry elements in different layers.).

It is possible to store several 'layers' in one vector dataset. For example, fields, forests and lakes can be stored in one vector. Adjacent forest and lake can share the same boundary, but they have separate attribute tables. It is also possible to attach attributes to boundaries. For example, the boundary between lake and forest is a road, so it can have a different attribute table.

The 'layer' of the feature is defined by 'layer' inside GRASS. 'Layer' is the number which defines if there are more than one layer inside the dataset, e.g. if the geometry is forest or lake. For now, it can be only a number, in the future GRASS will also support names as fields in the user interface.

Attributes can be stored inside the GRASS `LOCATION` as DBase or SQLITE3 or in external database tables, for example PostgreSQL, MySQL, Oracle, etc.

Attributes in database tables are linked to geometry elements using a 'category' value.

'Category' (key, ID) is an integer attached to geometry primitives, and it is used as the link to one key column in the database table.

Tip: Learning the GRASS Vector Model

The best way to learn the GRASS vector model and its capabilities is to download one of the many GRASS tutorials where the vector model is described more deeply. See http://grass.osgeo.org/documentation/manuals/ for more information, books and tutorials in several languages.

16.6 Creating a new GRASS vector layer

To create a new GRASS vector layer with the GRASS plugin click the Create new GRASS vector toolbar icon. Enter a name in the text box and you can start digitizing point, line or polygon geometries, following the procedure described in Section *Digitizing and editing a GRASS vector layer*.

In GRASS it is possible to organize all sort of geometry types (point, line and area) in one layer, because GRASS uses a topological vector model, so you don't need to select the geometry type when creating a new GRASS vector. This is different from Shapefile creation with QGIS, because Shapefiles use the Simple Feature vector model (see Section *Creating new Vector layers*).

Tip: Creating an attribute table for a new GRASS vector layer

If you want to assign attributes to your digitized geometry features, make sure to create an attribute table with columns before you start digitizing (see figure_grass_digitizing_5).

16.7 Digitizing and editing a GRASS vector layer

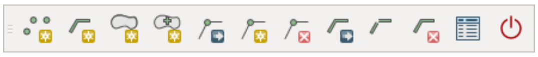
The digitizing tools for GRASS vector layers are accessed using the Edit GRASS vector layer icon on the toolbar. Make sure you have loaded a GRASS vector and it is the selected layer in the legend before clicking on the edit tool. Figure figure_grass_digitizing_2 shows the GRASS edit dialog that is displayed when you click on the edit tool. The tools and settings are discussed in the following sections.

Tip: Digitizing polygons in GRASS

If you want to create a polygon in GRASS, you first digitize the boundary of the polygon, setting the mode to 'No category'. Then you add a centroid (label point) into the closed boundary, setting the mode to 'Next not used'. The reason is, that a topological vector model links attribute information of a polygon always to the centroid and not to the boundary.

Toolbar

In figure_grass_digitizing_1 you see the GRASS digitizing toolbar icons provided by the GRASS plugin. Table table_grass_digitizing_1 explains the available functionalities.



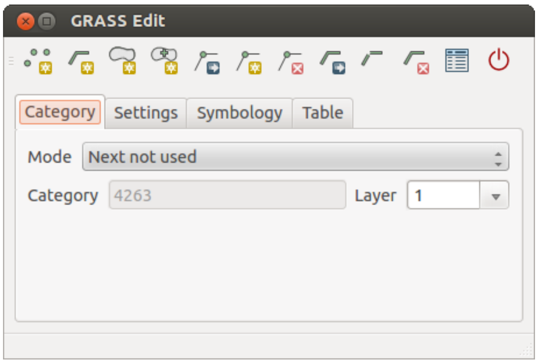
Gambar 16.3: GRASS Digitizing Toolbar

Icon	Tool	Purpose
	New Point	Digitize new point
	New Line	Digitize new line
	New Boundary	Digitize new boundary (finish by selecting new tool)
	New Centroid	Digitize new centroid (label existing area)
	Move vertex	Move one vertex of existing line or boundary and identify new position
	Add vertex	Add a new vertex to existing line
	Delete vertex	Delete vertex from existing line (confirm selected vertex by another click)
	Move element	Move selected boundary, line, point or centroid and click on new position
	Split line	Split an existing line to 2 parts
	Delete element	Delete existing boundary, line, point or centroid (confirm selected element by another click)
	Edit attributes	Edit attributes of selected element (note that one element can represent more features, see above)
	Close	Close session and save current status (rebuilds topology afterwards)

Table GRASS Digitizing 1: GRASS Digitizing Tools

Category Tab

The *Category* tab allows you to define the way in which the category values will be assigned to a new geometry element.



Mode: Next not used

Category: 4263

Layer: 1

Gambar 16.4: GRASS Digitizing Category Tab

- **Mode**: what category value shall be applied to new geometry elements.
  - Next not used - apply next not yet used category value to geometry element.
  - Manual entry - manually define the category value for the geometry element in the ‘Category’-entry field.
  - No category - Do not apply a category value to the geometry element. This is e.g. used for area boundaries, because the category values are connected via the centroid.

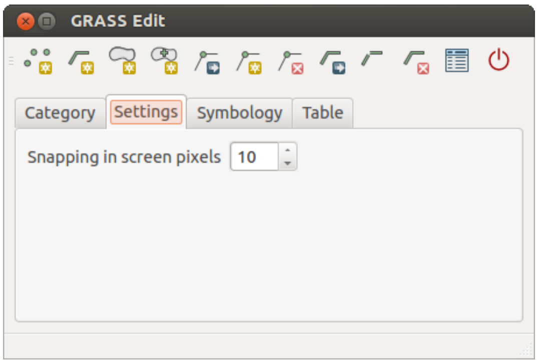
- **Category** - A number (ID) is attached to each digitized geometry element. It is used to connect each geometry element with its attributes.
- **Field (layer)** - Each geometry element can be connected with several attribute tables using different GRASS geometry layers. Default layer number is 1.

Tip: Creating an additional GRASS 'layer' with QGIS

If you would like to add more layers to your dataset, just add a new number in the 'Field (layer)' entry box and press return. In the Table tab you can create your new table connected to your new layer.

Settings Tab

The *Settings* tab allows you to set the snapping in screen pixels. The threshold defines at what distance new points or line ends are snapped to existing nodes. This helps to prevent gaps or dangles between boundaries. The default is set to 10 pixels.

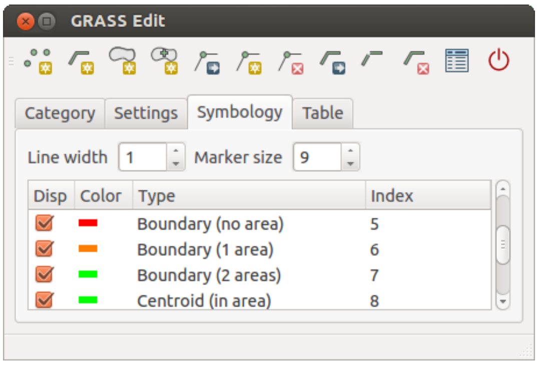


Snapping in screen pixels 10

Gambar 16.5: GRASS Digitizing Settings Tab

Symbology Tab

The *Symbology* tab allows you to view and set symbology and color settings for various geometry types and their topological status (e.g. closed / opened boundary).



Line width 1 Marker size 9

Disp	Color	Type	Index
☑	🟥	Boundary (no area)	5
☑	🟧	Boundary (1 area)	6
☑	🟩	Boundary (2 areas)	7
☑	🟩	Centroid (in area)	8

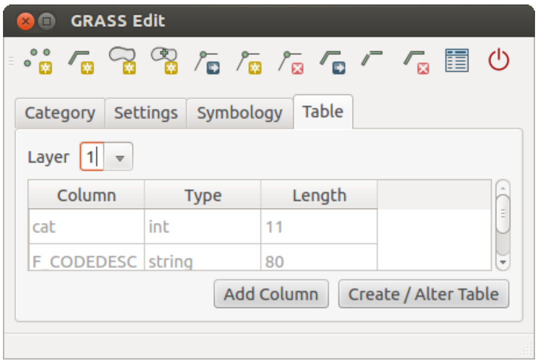
Gambar 16.6: GRASS Digitizing Symbolog Tab

Table Tab

The *Table* tab provides information about the database table for a given 'layer'. Here you can add new columns to an existing attribute table, or create a new database table for a new GRASS vector layer (see Section *Creating a new GRASS vector layer*).

Tip: GRASS Edit Permissions

You must be the owner of the GRASS `MAPSET` you want to edit. It is impossible to edit data layers in a `MAPSET` that is not yours, even if you have write permissions.



Layer 1

Column	Type	Length
cat	int	11
F CODEDESC	string	80

Gambar 16.7: GRASS Digitizing Table Tab

16.8 The GRASS region tool

The region definition (setting a spatial working window) in GRASS is important for working with raster layers. Vector analysis is by default not limited to any defined region definitions. But all newly-created rasters will have the spatial extension and resolution of the currently defined GRASS region, regardless of their original extension and resolution. The current GRASS region is stored in the `$LOCATION/$MAPSET/WIND` file, and it defines north, south, east and west bounds, number of columns and rows, horizontal and vertical spatial resolution.

It is possible to switch on/off the visualization of the GRASS region in the QGIS canvas using the Display current GRASS region button.

With the Edit current GRASS region icon you can open a dialog to change the current region and the symbology of the GRASS region rectangle in the QGIS canvas. Type in the new region bounds and resolution and click **[OK]**. It also allows to select a new region interactively with your mouse on the QGIS canvas. Therefore click with the left mouse button in the QGIS canvas, open a rectangle, close it using the left mouse button again and click **[OK]**.

The GRASS module `g.region` provide a lot more parameters to define an appropriate region extend and resolution for your raster analysis. You can use these parameters with the GRASS Toolbox, described in Section *The GRASS toolbox*.

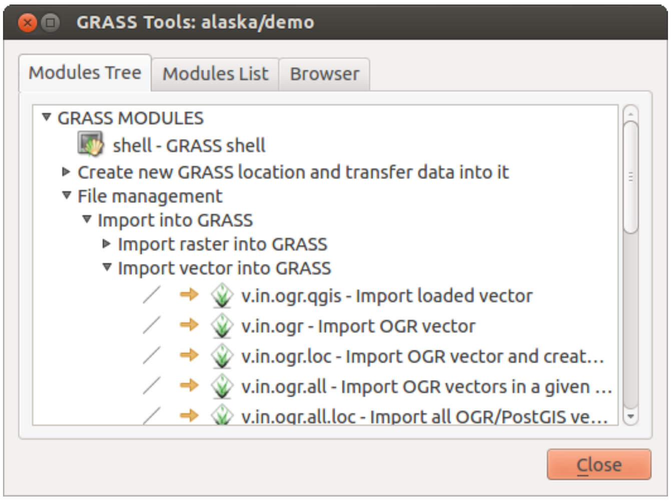
16.9 The GRASS toolbox

The Open GRASS Tools box provides GRASS module functionalities to work with data inside a selected GRASS `LOCATION` and `MAPSET`. To use the GRASS toolbox you need to open a `LOCATION` and `MAPSET` where you have write-permission (usually granted, if you created the `MAPSET`). This is necessary, because new raster or vector layers created during analysis need to be written to the currently selected `LOCATION` and `MAPSET`.

The GRASS Shell inside the GRASS Toolbox provides access to almost all (more than 330) GRASS modules through a command line interface. To offer a more user friendly working environment, about 200 of the available GRASS modules and functionalities are also provided by graphical dialogs within the GRASS plugin Toolbox.

16.9.1 Working with GRASS modules

The GRASS Shell inside the GRASS Toolbox provides access to almost all (more than 300) GRASS modules in a command line interface. To offer a more user friendly working environment, about 200 of the available GRASS modules and functionalities are also provided by graphical dialogs.


GRASS Tools: alaska/demo
Modules Tree
Modules List
Browser
GRASS MODULES
shell - GRASS shell
Create new GRASS location and transfer data into it
File management
Import into GRASS
Import raster into GRASS
Import vector into GRASS
v.in.ogr.qgis - Import loaded vector
v.in.ogr - Import OGR vector
v.in.ogr.loc - Import OGR vector and creat...
v.in.ogr.all - Import OGR vectors in a given ...
v.in.ogr.all.loc - Import all OGR/PostGIS ve...
Close

Gambar 16.8: GRASS Toolbox and Module Tree

A complete list of GRASS modules available in the graphical Toolbox in QGIS version 2.0 is available in the GRASS wiki (http://grass.osgeo.org/wiki/GRASS-QGIS_relevant_module_list).

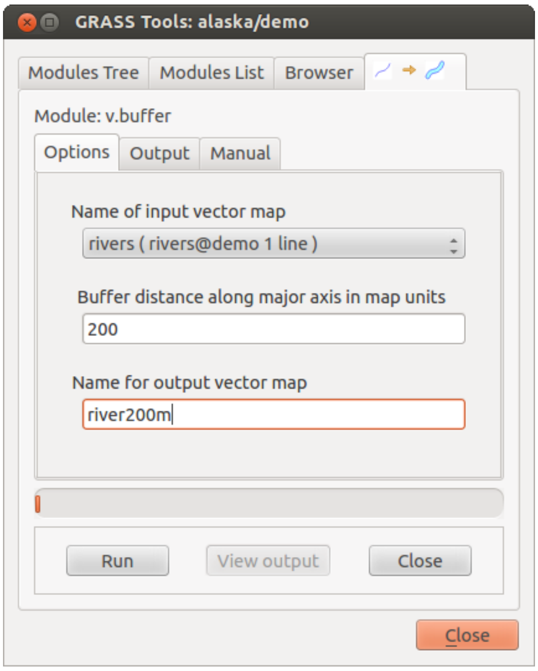
It is also possible to customize the GRASS Toolbox content. This procedure is described in Section *Customizing the GRASS Toolbox*.

As shown in figure_grass_toolbox_1 , you can look for the appropriate GRASS module using the thematically grouped *Modules Tree* or the searchable *Modules List* tab.

Clicking on a graphical module icon a new tab will be added to the toolbox dialog providing three new sub-tabs *Options*, *Output* and *Manual*.

Options

The *Options* tab provides a simplified module dialog where you can usually select a raster or vector layer visualized in the QGIS canvas and enter further module specific parameters to run the module.


GRASS Tools: alaska/demo
Modules Tree
Modules List
Browser
Options
Output
Manual
Run
View output
Close
Close

Module: v.buffer

Name of input vector map
rivers (rivers@demo 1 line)

Buffer distance along major axis in map units
200

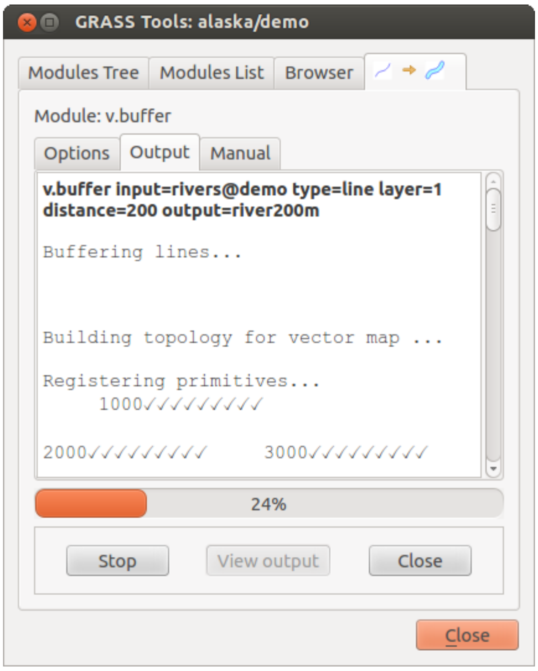
Name for output vector map
river200m

Gambar 16.9: GRASS Toolbox Module Options

The provided module parameters are often not complete to keep the dialog clear. If you want to use further module parameters and flags, you need to start the GRASS Shell and run the module in the command line.

A new feature since QGIS 1.8 is the support for a *show advanced options* button below the simplified module dialog in the *Options* tab. At the moment it is only added to the module v.in.ascii as an example use, but will probably be part of more / all modules in the GRASS toolbox in future versions of QGIS. This allows to use the complete GRASS module options without the need to switch to the GRASS Shell.

Output



```
v.buffer input=rivers@demo type=line layer=1
distance=200 output=river200m

Buffering lines...



Building topology for vector map ...

Registering primitives...
     1000✓✓✓✓✓✓✓✓✓

2000✓✓✓✓✓✓✓✓✓     3000✓✓✓✓✓✓✓✓✓
```

Gambar 16.10: GRASS Toolbox Module Output

The *Output* tab provides information about the output status of the module. When you click the **[Run]** button, the module switches to the *Output* tab and you see information about the analysis process. If all works well, you will finally see a `Successfully finished` message.

Manual

The *Manual* tab shows the HTML help page of the GRASS module. You can use it to check further module parameters and flags or to get a deeper knowledge about the purpose of the module. At the end of each module manual page you see further links to the `Main Help index`, the `Thematic index` and the `Full index`. These links provide the same information as if you use the module `g.manual`.

Tip: Display results immediately

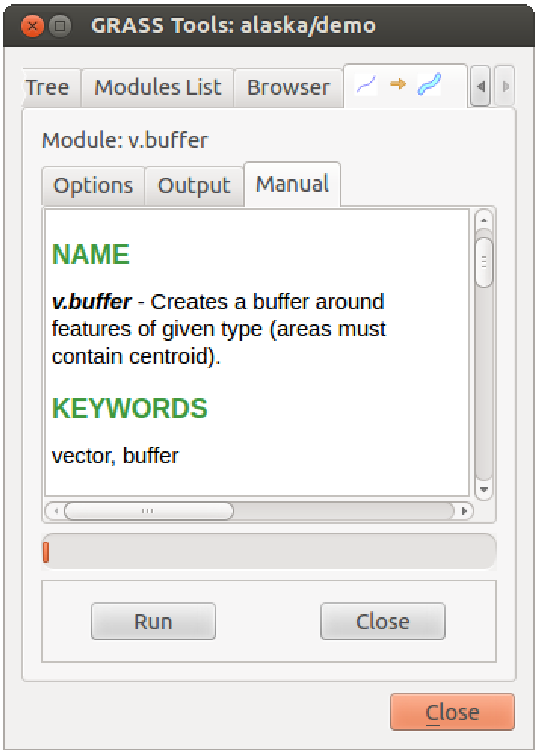
If you want to display your calculation results immediately in your map canvas, you can use the 'View Output' button at the bottom of the module tab.

16.9.2 GRASS module examples

The following examples will demonstrate the power of some of the GRASS modules.

Creating contour lines

The first example creates a vector contour map from an elevation raster (DEM). Assuming you have the Alaska `LOCATION` set up as explained in Section *Importing data into a GRASS LOCATION*.



NAME

v.buffer - Creates a buffer around features of given type (areas must contain centroid).

KEYWORDS

vector, buffer

Gambar 16.11: GRASS Toolbox Module Manual

- First open the location by clicking the Open mapset button and choosing the Alaska location.
- Now load the `gtopo30` elevation raster by clicking Add GRASS raster layer and selecting the `gtopo30` raster from the demo location.
- Now open the Toolbox with the Open GRASS tools button.
- In the list of tool categories double click *Raster* → *Surface Management* → *Generate vector contour lines*.
- Now a single click on the tool **r.contour** will open the tool dialog as explained above *Working with GRASS modules*. The `gtopo30` raster should appear as the *Name of input raster*.
- Type into the *Increment between Contour levels* 1,00 the value 100. (This will create contour lines at intervals of 100 meters.)
- Type into the *Name for output vector map* the name `ctour_100`.
- Click **[Run]** to start the process. Wait for several moments until the message `Successfully finished` appears in the output window. Then click **[View Output]** and **[Close]**.

Since this is a large region, it will take a while to display. After it finishes rendering, you can open the layer properties window to change the line color so that the contours appear clearly over the elevation raster, as in *The Vector Properties Dialog*.

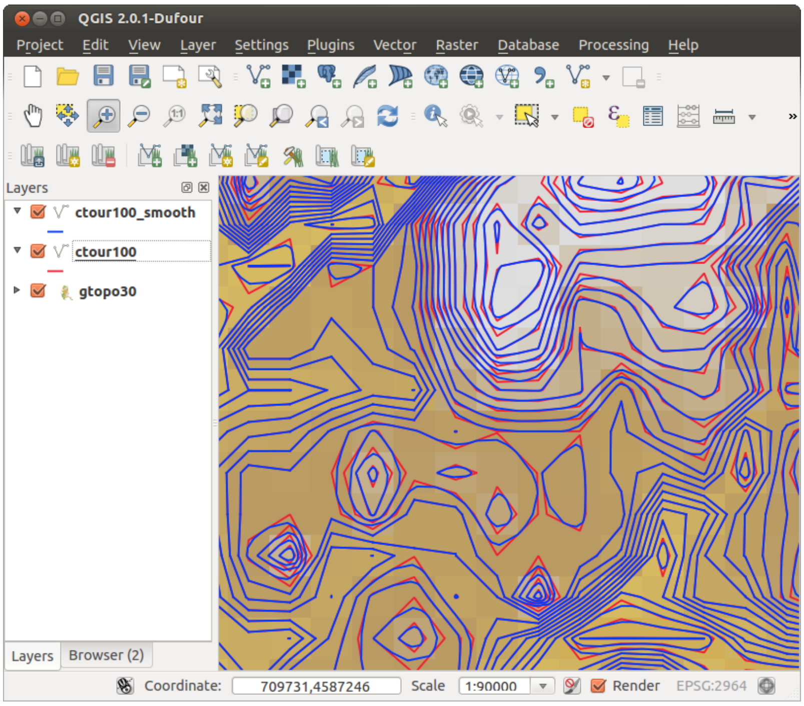
Next zoom in to a small mountainous area in the center of Alaska. Zooming in close you will notice that the contours have sharp corners. GRASS offers the **v.generalize** tool to slightly alter vector maps while keeping their overall shape. The tool uses several different algorithms with different purposes. Some of the algorithms (i.e. Douglas Peuker and Vertex reduction) simplify the line by removing some of the vertices. The resulting vector will load faster. This process will be used when you have a highly detailed vector, but you are creating a very small scale map, so the detail is unnecessary.

Tip: The simplify tool

Note that the QGIS fTools plugin has a *Simplify geometries* → tool that works just like the GRASS **v.generalize** Douglas-Peuker algorithm.

However, the purpose of this example is different. The contour lines created by `r.contour` have sharp angles that should be smoothed. Among the **v.generalize** algorithms there is Chaikens which does just that (also Hermite splines). Be aware that these algorithms can **add** additional vertices to the vector, causing it to load even more slowly.

- Open the GRASS toolbox and double click the categories *Vector* → *Develop map* → *Generalization*, then click on the **v.generalize** module to open its options window.
- Check that the 'ctour_100' vector appears as the *Name of input vector*.
- From the list of algorithms choose Chaiken's. Leave all other options at their default, and scroll down to the last row to enter in the field *Name for output vector map* 'ctour_100_smooth', and click **[Run]**.
- The process takes several moments. Once `Successfully finished` appears in the output windows, click **[View output]** and then **[close]**.
- You may change the color of the vector to display it clearly on the raster background and to contrast with the original contour lines. You will notice that the new contour lines have smoother corners than the original while staying faithful to the original overall shape.


QGIS 2.0.1-Dufour
Project Edit View Layer Settings Plugins Vector Raster Database Processing Help
Layers
ctour100_smooth
ctour100
gtopo30
Layers Browser (2)
Coordinate: 709731,4587246
Scale 1:90000
Render
EPSG:2964

Gambar 16.12: GRASS module v.generalize to smooth a vector map

Tip: Other uses for r.contour

The procedure described above can be used in other equivalent situations. If you have a raster map of precipitation data, for example, then the same method will be used to create a vector map of isohyetal (constant rainfall) lines.

Creating a Hillshade 3D effect

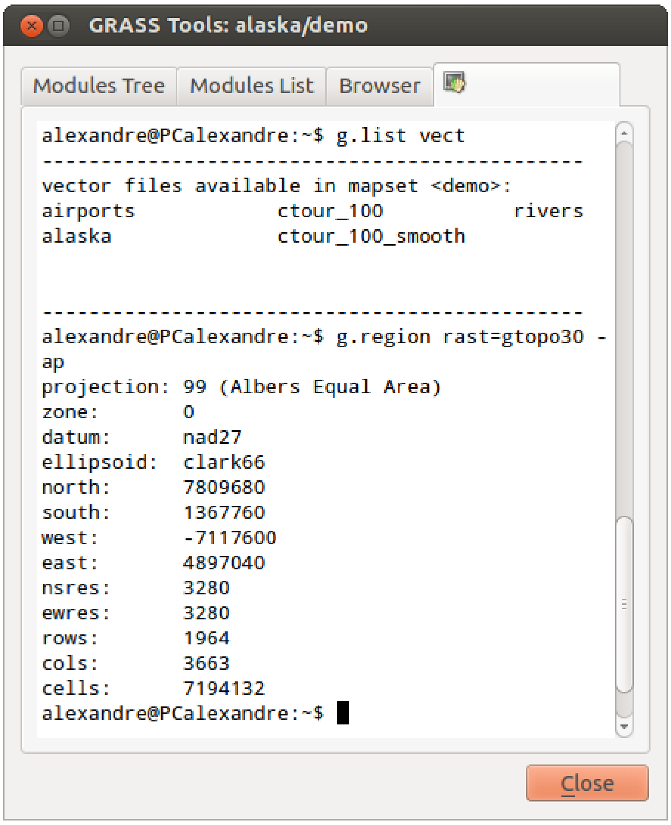
Several methods are used to display elevation layers and give a 3D effect to maps. The use of contour lines as shown above is one popular method often chosen to produce topographic maps. Another way to display a 3D effect is by hillshading. The hillshade effect is created from a DEM (elevation) raster by first calculating the slope and aspect of each cell, then simulating the sun's position in the sky and giving a reflectance value to each cell. Thus you get sun facing slopes lighted and the slopes facing away from the sun (in shadow) are darkened.

- Begin this example by loading the `gtopo30` elevation raster. Start the GRASS toolbox and under the Raster category double click to open *Spatial analysis* → *Terrain analysis*.
- Then click **r.shaded.relief** to open the module.
- Change the *azimuth angle* 1,00 ⇕ 270 to 315.
- Enter `gtopo30_shade` for the new hillshade raster, and click **[Run]**.
- When the process completes, add the hillshade raster to the map. You should see it displayed in grayscale.
- To view both the hill shading and the colors of the `gtopo30` together shift the hillshade map below the `gtopo30` map in the table of contents, then open the *Properties* window of `gtopo30`, switch to the *transparency* tab and set its transparency level to about 25%.

You should now have the `gtopo30` elevation with its colormap and transparency setting displayed **above** the grayscale hillshade map. In order to see the visual effects of the hillshading, turn off the `gtopo30_shade` map, then turn it back on.

Using the GRASS shell

The GRASS plugin in QGIS is designed for users who are new to GRASS, and not familiar with all the modules and options. As such, some modules in the toolbox do not show all the options available, and some modules do not appear at all. The GRASS shell (or console) gives the user access to those additional GRASS modules that do not appear in the toolbox tree, and also to some additional options to the modules that are in the toolbox with the simplest default parameters. This example demonstrates the use of an additional option in the **r.shaded.relief** module that was shown above.



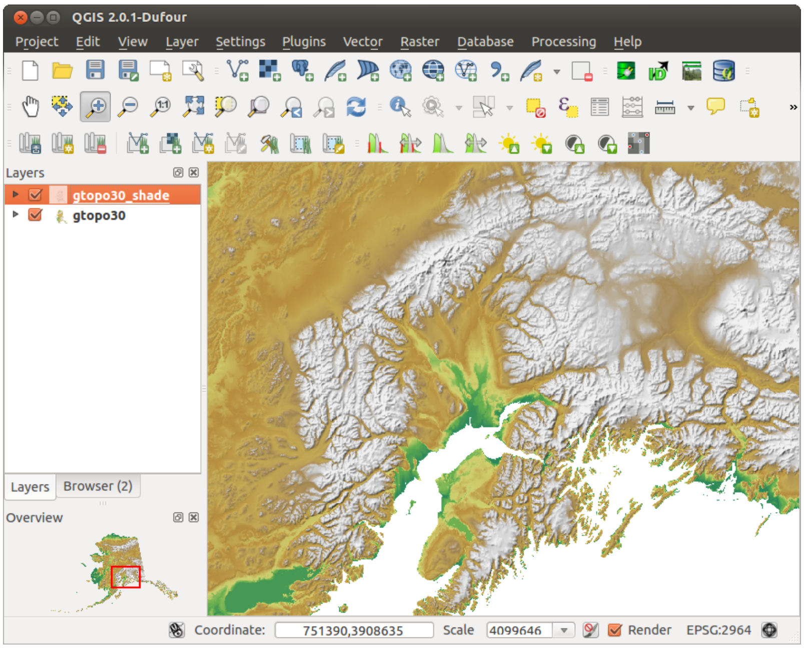
```
alexandre@PCalexandre:~$ g.list vect
----------------------------------------------
vector files available in mapset <demo>:
airports              ctour_100            rivers
alaska                ctour_100_smooth


----------------------------------------------
alexandre@PCalexandre:~$ g.region rast=gtopo30 -
ap
projection: 99 (Albers Equal Area)
zone:       0
datum:      nad27
ellipsoid:  clark66
north:      7809680
south:      1367760
west:       -7117600
east:       4897040
nsres:      3280
ewres:      3280
rows:       1964
cols:       3663
cells:      7194132
alexandre@PCalexandre:~$ █
```

Gambar 16.13: The GRASS shell, r.shaded.relief module

The module **r.shaded.relief** can take a parameter `zmult` which multiplies the elevation values relative to the X-Y coordinate units so that the hillshade effect is even more pronounced.

- Load the `gtopo30` elevation raster as above, then start the GRASS toolbox and click on the GRASS shell. In the shell window type the command `r.shaded.relief map=gtopo30 shade=gtopo30_shade2 azimuth=315 zmult=3` and press **[Enter]**.

- After the process finishes shift to the *Browse* tab and double click on the new `gtopo30_shade2` raster to display in QGIS.
- As explained above, shift the shaded relief raster below the gtopo30 raster in the Table of Contents, then check transparency of the colored gtopo30 layer. You should see that the 3D effect stands out more strongly compared to the first shaded relief map.



Coordinate: 751390,3908635

Scale 4099646

Gambar 16.14: Displaying shaded relief created with the GRASS module r.shaded.relief 🐧

Raster statistics in a vector map

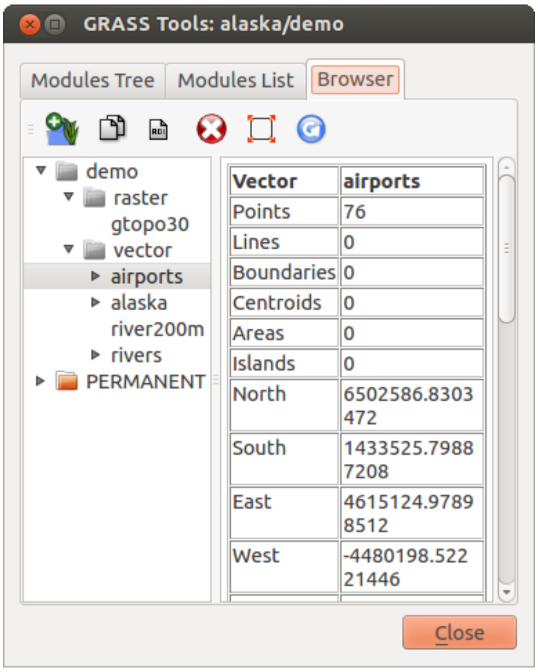
The next example shows how a GRASS module can aggregate raster data and add columns of statistics for each polygon in a vector map.

- Again using the Alaska data, refer to *Importing data into a GRASS LOCATION* to import the trees shapefile from the `shapefiles` directory into GRASS.
- Now an intermediary step is required: centroids must be added to the imported trees map to make it a complete GRASS area vector (including both boundaries and centroids).
- From the toolbox choose *Vector* → *Manage features*, and open the module **v.centroids**.
- Enter as the *output vector map* 'forest_areas' and run the module.
- Now load the `forest_areas` vector and display the types of forests - deciduous, evergreen, mixed - in different colors: In the layer *Properties* window, *Symbology* tab, choose from *Legend type* …▼ 'Unique value' and set the *Classification field* to 'VEGDESC'. (Refer to the explanation of the symbology tab :ref:sec_symbology in the vector section).
- Next reopen the GRASS toolbox and open *Vector* → *Vector update* by other maps.
- Click on the **v.rast.stats** module. Enter `gtopo30`, and `forest_areas`.
- Only one additional parameter is needed: Enter *column prefix* `elev`, and click **[run]**. This is a computationally heavy operation which will run for a long time (probably up to two hours).
- Finally open the `forest_areas` attribute table, and verify that several new columns have been added including `elev_min`, `elev_max`, `elev_mean` etc. for each forest polygon.

16.9.3 Working with the GRASS LOCATION browser

Another useful feature inside the GRASS Toolbox is the GRASS `LOCATION` browser. In figure_grass_module_7 you can see the current working `LOCATION` with its `MAPSETs`.

In the left browser windows you can browse through all `MAPSETs` inside the current `LOCATION`. The right browser window shows some meta information for selected raster or vector layers, e.g. resolution, bounding box, data source, connected attribute table for vector data and a command history.



Vector	airports
Points	76
Lines	0
Boundaries	0
Centroids	0
Areas	0
Islands	0
North	6502586.8303472
South	1433525.79887208
East	4615124.97898512
West	-4480198.52221446

Gambar 16.15: GRASS LOCATION browser

The toolbar inside the *Browser* tab offers following tools to manage the selected `LOCATION`:

- *Add selected map to canvas*
- *Copy selected map*
- *Rename selected map*
- *Delete selected map*
- *Set current region to selected map*
- *Refresh browser window*

The *Rename selected map* and *Delete selected map* only work with maps inside your currently selected `MAPSET`. All other tools also work with raster and vector layers in another `MAPSET`.

16.9.4 Customizing the GRASS Toolbox

Nearly all GRASS modules can be added to the GRASS toolbox. A XML interface is provided to parse the pretty simple XML files which configures the modules appearance and parameters inside the toolbox.

A sample XML file for generating the module `v.buffer` (v.buffer.qgm) looks like this:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE qgisgrassmodule SYSTEM "http://mrcc.com/qgisgrassmodule.dtd">

<qgisgrassmodule label="Vector buffer" module="v.buffer">
        <option key="input" typeoption="type" layeroption="layer" />
        <option key="buffer"/>
        <option key="output" />
</qgisgrassmodule>
```

The parser reads this definition and creates a new tab inside the toolbox when you select the module. A more detailed description for adding new modules, changing the modules group, etc. can be found on the QGIS wiki at http://hub.qgis.org/projects/quantum-gis/wiki/Adding_New_Tools_to_the_GRASS_Toolbox

BAB 17

QGIS kerangka pengolahan

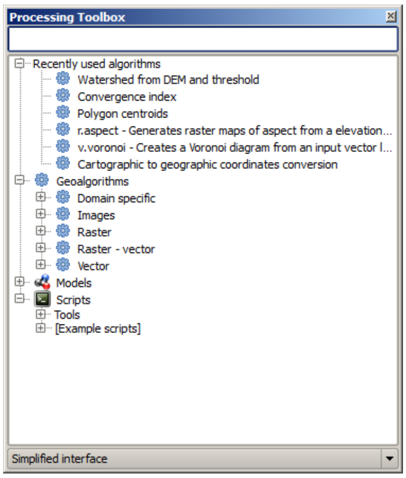
17.1 Pengantar

Bab ini memperkenalkan kerangka pengolahan QGIS, lingkungan geoprocessing yang dapat digunakan untuk memanggil algoritma asli dan pihak ketiga dari QGIS, membuat tugas analisis spasial Anda lebih produktif dan mudah untuk melakukannya.

Pada bagian berikut kita akan meninjau bagaimana menggunakan unsur-unsur grafis dari kerangka kerja ini dan mengambil yang terbaik masing-masing dari mereka.

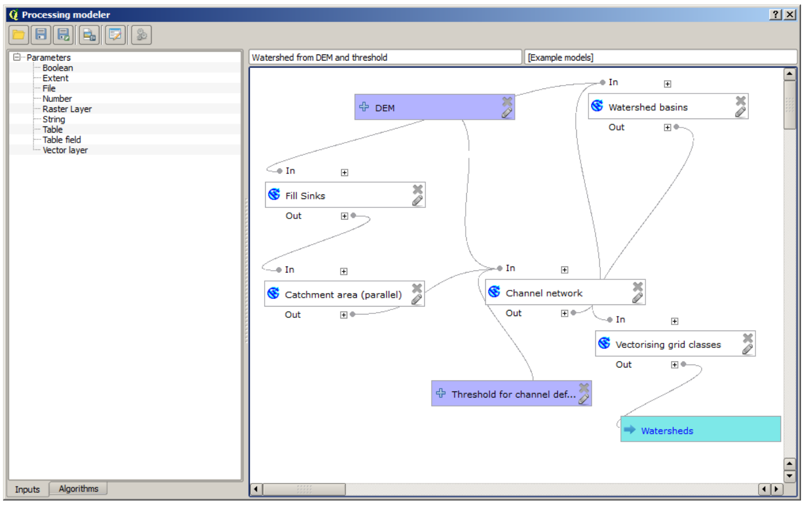
Ada empat elemen dasar dalam kerangka GUI, yang digunakan untuk menjalankan algoritma untuk tujuan yang berbeda. Memilih salah satu alat atau lain akan tergantung pada jenis analisis yang akan dilakukan dan karakteristik tertentu dari masing-masing pengguna dan proyek. Semuanya (kecuali untuk antarmuka batch processing, yang disebut dari toolbox, seperti akan kita lihat) bisa diakses dari menu *Pengolahan* (Anda akan melihat lebih dari empat entri. Yang tersisa tidak digunakan untuk mengeksekusi algoritma dan akan dijelaskan nanti dalam bab ini).

- Toolbox. Unsur utama dari GUI, digunakan untuk menjalankan algoritma tunggal atau menjalankan proses batch berdasarkan algoritma tersebut.


Processing Toolbox
Recently used algorithms
Watershed from DEM and threshold
Convergence index
Polygon centroids
r.aspect - Generates raster maps of aspect from a elevation...
v.voronoi - Creates a Voronoi diagram from an input vector l...
Cartographic to geographic coordinates conversion
Geoalgorithms
Domain specific
Images
Raster
Raster - vector
Vector
Models
Scripts
Tools
[Example scripts]
Simplified interface

Gambar 17.1: Toolbox Pengolahan

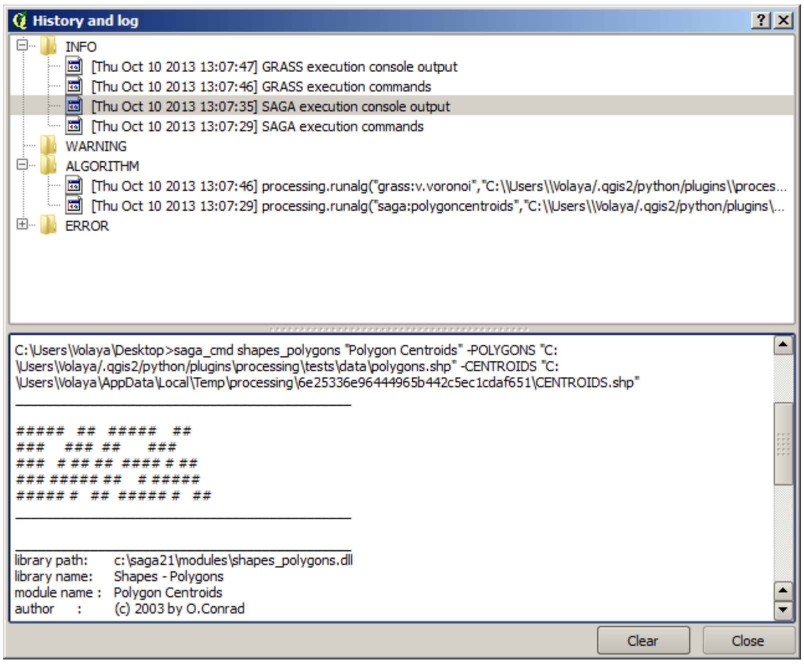
- Modeler grafis. Beberapa algoritma dapat dikombinasikan secara grafis dengan menggunakan modeler untuk mendefinisikan alur kerja, menciptakan satu proses yang melibatkan beberapa sub-proses
- Sejarah pengelola. Semua tindakan dilakukan dengan menggunakan salah satu elemen tersebut disimpan dalam berkas sejarah dan dapat kemudian dengan mudah direproduksi menggunakan manajer sejarah
- Antarmuka pengolahan batch. Antarmuka ini memungkinkan Anda untuk menjalankan proses batch dan mengotomatisasi eksekusi algoritma tunggal pada beberapa dataset.


Processing modeler
Parameters
Boolean
Extent
File
Number
Raster Layer
String
Table
Table field
Vector layer
Inputs
Algorithms
DEM
In
Watershed basins
Out
Fill Sinks
Catchment area (parallel)
Channel network
Vectorising grid classes
Threshold for channel def...
Watersheds

Watershed from DEM and threshold

[Example models]

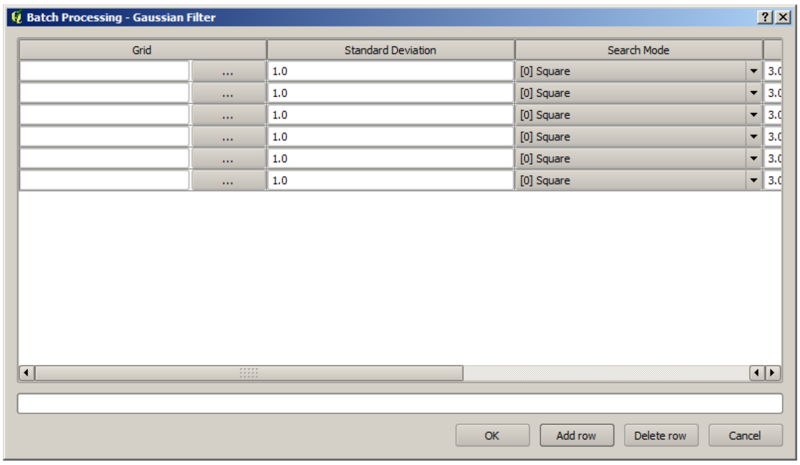
Gambar 17.2: Modeler Pengolahan


History and log
Clear
Close

```
INFO
    [Thu Oct 10 2013 13:07:47] GRASS execution console output
    [Thu Oct 10 2013 13:07:46] GRASS execution commands
    [Thu Oct 10 2013 13:07:35] SAGA execution console output
    [Thu Oct 10 2013 13:07:29] SAGA execution commands
WARNING
ALGORITHM
    [Thu Oct 10 2013 13:07:46] processing.runalg("grass:v.voronoi","C:\\Users\\Volaya/.qgis2/python/plugins\\proces...
    [Thu Oct 10 2013 13:07:29] processing.runalg("saga:polygoncentroids","C:\\Users\\Volaya/.qgis2/python/plugins\...
ERROR
```

```
C:\Users\Volaya\Desktop>saga_cmd shapes_polygons "Polygon Centroids" -POLYGONS "C:
\Users\Volaya/.qgis2/python/plugins\processing\tests\data\polygons.shp" -CENTROIDS "C:
\Users\Volaya\AppData\Local\Temp\processing\6e25336e96444965b442c5ec1cdaf651\CENTROIDS.shp"
_____________________________________________

#####  ##  #####   ##
###   ### ##    ###
###  # ## ## #### # ##
### ##### ##   # #####
##### #  ## ##### #  ##

_____________________________________________

_____________________________________________
library path:   c:\saga21\modules\shapes_polygons.dll
library name:   Shapes - Polygons
module name :   Polygon Centroids
author     :    (c) 2003 by O.Conrad
```

Gambar 17.3: Pengolahan Sejarah


Batch Processing - Gaussian Filter
OK
Add row
Delete row
Cancel

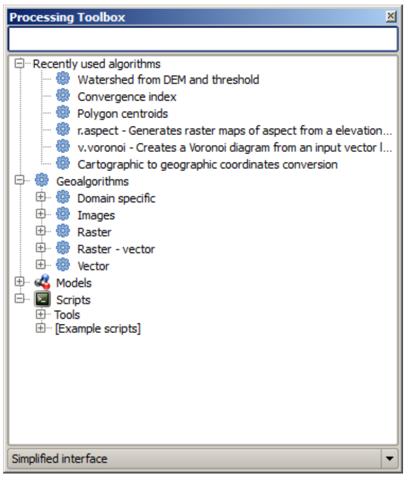
Grid		Standard Deviation	Search Mode	
	...	1.0	[0] Square	3.
	...	1.0	[0] Square	3.
	...	1.0	[0] Square	3.
	...	1.0	[0] Square	3.
	...	1.0	[0] Square	3.
	...	1.0	[0] Square	3.

Gambar 17.4: Antarmuka proses batch

Sepanjang bagian berikut kita akan meninjau masing-masing elemen ini secara rinci.

17.2 The toolbox

The *Toolbox* is the main element of the processing GUI, and the one that you are more likely to use in your daily work. It shows the list of all available algorithms grouped in different blocks, and is the access point to run them whether as a single process or as a batch process involving several executions of a same algorithm on different sets of inputs.


Processing Toolbox
Recently used algorithms
Watershed from DEM and threshold
Convergence index
Polygon centroids
r.aspect - Generates raster maps of aspect from a elevation...
v.voronoi - Creates a Voronoi diagram from an input vector l...
Cartographic to geographic coordinates conversion
Geoalgorithms
Domain specific
Images
Raster
Raster - vector
Vector
Models
Scripts
Tools
[Example scripts]
Simplified interface

Gambar 17.5: Processing Toolbox

The toolbox contains all the available algorithms, divided into predefined groups. All these groups are found under a single tree entry named *Geoalgorithms*.

Additionally, two more entries are found, namely *Models* and *Scripts*. These include user-created algorithms, and allow you to define your own workflows and processing tasks. We will devote a full section to them a bit later.

In the upper part of the toolbox you can find a text box. To reduce the number of algorithms shown in the toolbox and make it easier to find the one you need, you can enter any word or phrase on the text box. Notice that, as you type, the number of algorithms in the toolbox is reduced to just those which contain the text you have entered in their names.

In the lower part you will find a box that allows you to switch between the simplified algorithm list (the one explained above), and the advanced list. If you change to the advanced mode, the toolbox will look like this:

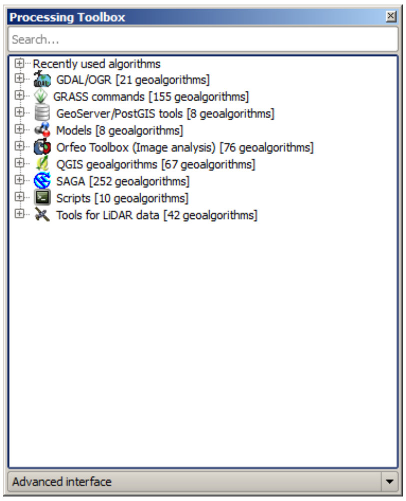
In the advanced view, each group represents a so-called 'algorithm provider', which is a set of algorithms coming from the same source, for instance, from a third-party application with geoprocessing capabilities. Some of this groups represent algorithms from one of such third-party applications (like SAGA, GRASS or R), while other contain algorithms directly coded as part of the processing plugin, not relying on any additional software.

This view is recommended to those users that have a certain knowledge of the applications that are backing those algorithms, since they will be shown with their original names and groups.

Also, some additional algorithms are available only in the advanced view, such as LiDAR tools or scripts based on the R statistical computing software, among others. Independent QGIS plugins that add new algorithms to the toolbox will only be shown in the advanced view.

In particular, the simplified view contains algorithms from the following providers:

- GRASS
- SAGA
- OTB
- Native QGIS algorithms


Processing Toolbox
Search...
Recently used algorithms
GDAL/OGR [21 geoalgorithms]
GRASS commands [155 geoalgorithms]
GeoServer/PostGIS tools [8 geoalgorithms]
Models [8 geoalgorithms]
Orfeo Toolbox (Image analysis) [76 geoalgorithms]
QGIS geoalgorithms [67 geoalgorithms]
SAGA [252 geoalgorithms]
Scripts [10 geoalgorithms]
Tools for LiDAR data [42 geoalgorithms]
Advanced interface

Gambar 17.6: Processing Toolbox (advanced mode)

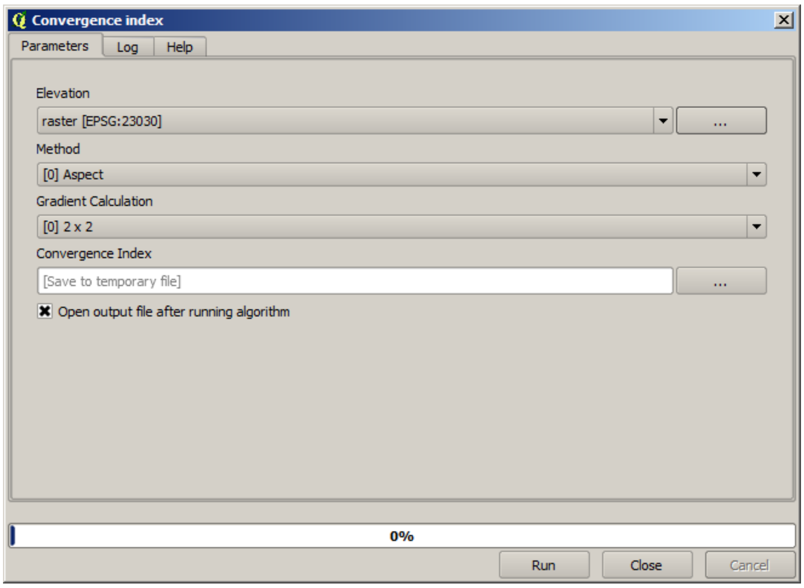
In the particular case of running QGIS under Windows, these algorithms are fully-functional in a fresh installation of QGIS and they can be run without requiring any additional installation. Also running them requires no prior knowledge of the external applications they use, making them more accesible for first-time users.

If you want to use an algorithm not provided by the any of above providers, switch to the advanced mode by selecting the corresponding option at the bottom of the toolbox.

To execute an algorithm, just double-click on its name in the toolbox.

17.2.1 The algorithm dialog

Once you double-click on the name of the algorithm that you want to execute, a dialog similar to the next one is shown (in this case, the dialog corresponds to the SAGA 'Convergence index' algorithm).


Convergence index
Parameters
Log
Help
...
...
0%
Run
Close
Cancel

Elevation: raster [EPSG:23030]

Method: [0] Aspect

Gradient Calculation: [0] 2 x 2

Convergence Index: [Save to temporary file]

☒ Open output file after running algorithm

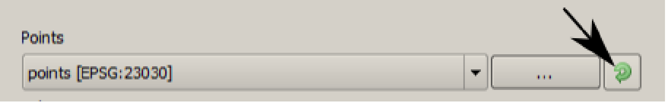
Gambar 17.7: Parameters Dialog

This dialog is used to set the input values that the algorithm needs to be executed. It shows a table where input values and configuration parameters are to be set. It, of course, has a different content depending on the requirements of the algorithm to be executed, and is created automatically based on those requirements. On the left side, the name of the parameter is shown. On the right side the value of the parameter can be set.

Although the number and type of parameters depend on the characteristics of the algorithm, the structure is similar for all of them. The parameters found on the table can be of one of the following types.

- A raster layer, to select from a list of all the ones available (currently opened) in QGIS. The selector contains as well a button on its right-hand side, to let you select filenames that represent layers currently not loaded in QGIS.
- A vector layer, to select from a list of all the ones available in the QGIS. Layers not loaded in QGIS can be selected as well, as in the case of raster layers, but only if the algorithm does not require a table field selected from the attributes table of the layer. In that case, only opened layers can be selected, since they need to be open so as to retrieve the list of field names available.

  You will see a button by each vector layer selector, as shown in the figure below.



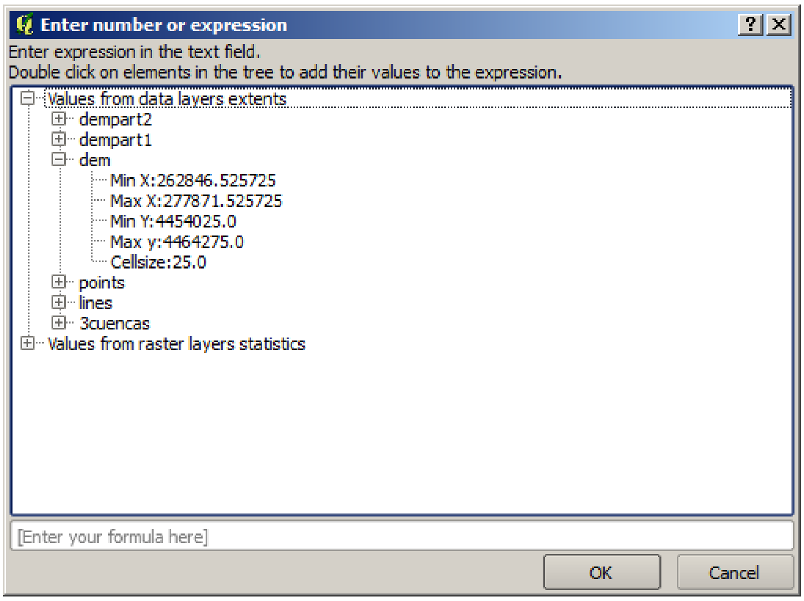
Points

points [EPSG:23030]

Gambar 17.8: Vector iterator button

If the algorithm contains several of them, you will be able to toggle just one of them. If the button corresponding to a vector input is toggled, the algorithm will be executed iteratively on each one of its features instead of just once for the whole layer, producing as many outputs as times the algorithm is executed. This allows for automating the process when all features in a layer have to be processed separately.

- A table, to select from a list of all the ones available in QGIS. Non-spatial tables are loaded into QGIS like vector layers, and in fact they are treated as such by the program. Currently, the list of available tables that you will see when executing an algorithm that needs one of them is restricted to tables coming from files in DBase (`.dbf`) or Comma-Separated Values (`.csv`) formats.
- An option, to choose from a selection list of possible options.
- A numerical value, to be introduced in a text box. You will find a button by its side. Clicking on it you will see a dialog that allows you to enter a mathematical expression, so you can use it as a handy calculator. Some useful variables related to data loaded into QGIS can be added to your expression, so you can select a value derived from any of this variables such as the cellsize of a layer or the northern most coordinate of another one.



Enter number or expression

Enter expression in the text field.
Double click on elements in the tree to add their values to the expression.

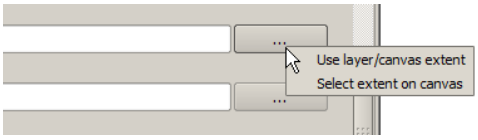
- Values from data layers extents
  - dempart2
  - dempart1
  - dem
    - Min X:262846.525725
    - Max X:277871.525725
    - Min Y:4454025.0
    - Max y:4464275.0
    - Cellsize:25.0
  - points
  - lines
  - 3cuencas
- Values from raster layers statistics

[Enter your formula here]

Gambar 17.9: Number Selector

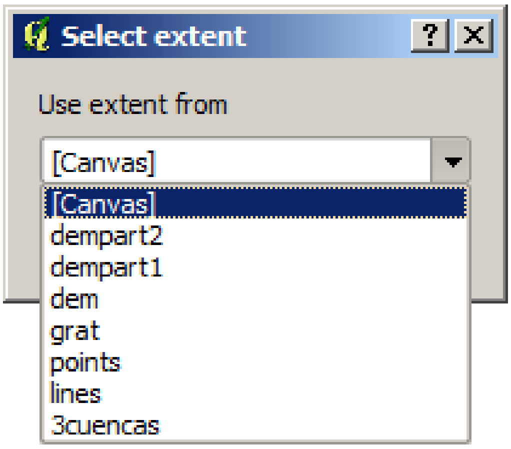
- A range, with min and max values to be introduced in two text boxes.
- A text string, to be introduced in a text box.

- A field, to choose from the attributes table of a vector layer or a single table selected in another parameter.
- A Coordinate Reference System. You can type the EPSG code directly in the text box, or select it from the CRS selection dialog that appear when you click on the button on the right-hand size
- A extent, to be entered by four number representing its `xmin`, `xmax`, `ymin`, `ymax` limits. Clicking on the button on the right-hand side of the value selector, a pop-up menu will appear, giving you two option: to select the value from a layer or the current canvas extent, or to define it by dragging directly onto the map canvas.



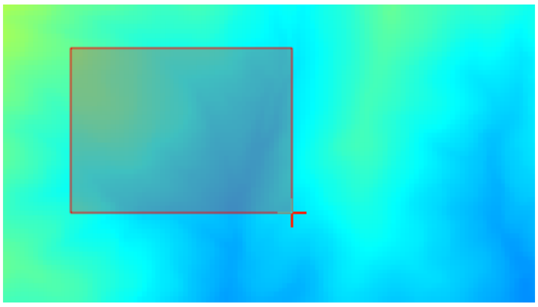
Gambar 17.10: Extent selector

If you select the first option, you will see a window like the next one.



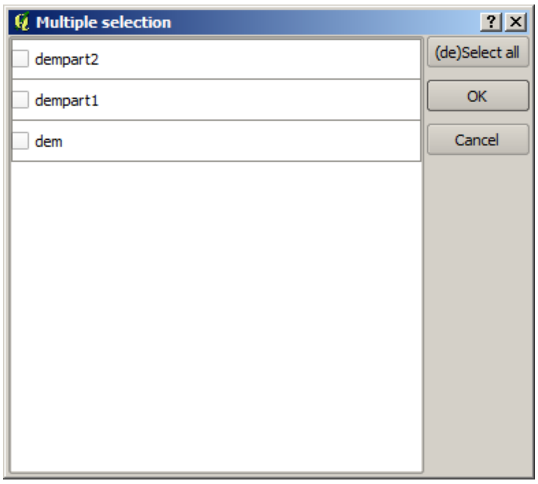
Gambar 17.11: Extent List

If you select the second one, the parameters window will hide itself, so you can click and drag onto the canvas. Once you have defined the selected rectangle, the dialog will reappear, containing the values in the extent text box.



Gambar 17.12: Extent Drag

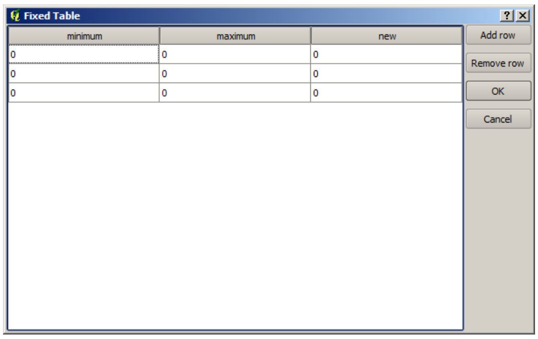
- A list of elements (whether raster layers, vector ones or tables), to select from the list of the ones available in QGIS. To make the selection, click on the small button on the left side of the corresponding row to see a dialog like the following one.
- A small table to be edited by the user. These are used to define parameters like lookup tables or convolution kernels, among others.



☐ dempart2
☐ dempart1
☐ dem

Gambar 17.13: Multiple Selection

Click on the button on the right side to see the table and edit its values.



minimum	maximum	new
0	0	0
0	0	0
0	0	0

Gambar 17.14: Fixed Table

Depending on the algorithm, the number of rows can be modified or not, using the buttons on the right side of the window.

You will find a **[Help]** tab in the the parameters dialog. If a help file is available, it will be shown, giving you more information about the algorithms and detailed descriptions of what each parameter does. Unfortunately, most algorithms lack good documentation, but if you feel like contributing to the project, this would be a good place to start.

A note on projections

Algorithms run from the processing framework — and also most of the external applications whose algorithms are exposed through it — do not perform any reprojection on input layers and assumes that all of them are already in a common coordinate system and ready to be analized. Whenever you use more than one layer as input to an algorithm, whether vector or raster, it is up to you to make sure that they are all in the same coordinate system.

Note that, due to QGIS‘s on-the-fly reprojecting capabilities, although two layers might seem to overlap and match, that might not be true if their original coordinates are used without reprojecting them onto a common coordinate system. That reprojection should be done manually and then use the resulting files as input to the algorithm. Also note that the reprojection process can be performed with the algorithms that are available in the processing framework itself.

By default, the parameters dialog will show a description of the CRS of each layer along with its name, making it easy to select layers that share the same CRS to be used as input layers. If you do not want to see this additional information, you can disable this functionality in the processing config dialog, unchecking the *Show CRS* option.

If you try to execute an algorithm using as input two or more layers with unmatching CRS's, a warning dialog will be shown.

You still can execute the algorithm, but be aware that in most cases that will produce wrong results, such as empty layers due to input layers not overlapping.

17.2.2 Data objects generated by algorithms

Data objects generated by an algorithm can be of any of the following types:

- A raster layer
- A vector layer
- A table
- An HTML file (used for text and graphical outputs)

They are all saved to disk, and the parameters table will contain a text box corresponding to each one of these outputs, where you can type the output channel to use for saving it. An output channel contains the information needed to save the resulting object somewhere. In the most usual case, you will save it to a file, but the architecture allows for any other way of storing it. For instance, a vector layer can be stored in a database or even uploaded to a remote server using a WFS-T service. Although solutions like these are not yet implemented, the processing framework is prepared to handle them, and we expect to add new kinds of output channels in a near feature.

To select an output channel, just click on the button on the right side of the text box. That will open a save file dialog, where you can select the desired filepath. Supported file extensions are shown in the file format selector of the dialog, depending on the kind of output and the algorithm.

The format of the output is defined by the filename extension. The supported formats depend on the ones supported by the algorithm itself. To select a format, just select the corresponding file extension (or add it if you are directly typing the filepath instead). If the extension of the filepath you entered does not match any of the supported ones, a default extension (usually `.dbf`` for tables, `.tif` for raster layers and `.shp` for vector ones) will be appended to the filepath and the file format corresponding to that extension will be used to save the layer or table.

If you do not enter any filename, the result will be saved as a temporary file and in the corresponding default file format, and will be deleted once you exit QGIS (take care with that in case you save your project and it contains temporary layers).

You can set a default folder for output data objects. Go to the configuration dialog (you can open it from the *Processing* menu), and in the *General* group you will find a parameter named *Output folder*. This output folder is used as the default path in case you type just a filename with no path (i.e. `myfile.shp`) when executing an algorithm.

When running an algorithm that uses vector layer in iterative mode, the entered file path is used as the base path for all generated files, which are named using the base name and appending a number representing the index of the iteration. The file extension (and format) is used for all those generated files.

Apart from raster layers and tables, algorithms also generates graphics and texts as HTML files. These results are shown at the end of the algorithm execution in a new dialog. This dialog will keep the results produced by any algorithm during the current session, and can be shown at any time by selecting the *Processing → Results viewer* from QGIS main menu.

Some external applications might have files (with no particular extension restrictions) as output, but they do not belong to any of the categories above. Those output files will not be processed by QGIS (opened or included into the current QGIS project), since most of the times correspond to file formats or elements not supported by QGIS. This is, for instance, the case with LAS files used for LiDAR data. The files get created, but you won't see anything new in your QGIS working session.

For all the other types of outputs, you will find a check box that you can use to tell the algorithm whether to load the file once it is generated by the algorithm or not. By default, all files are opened.

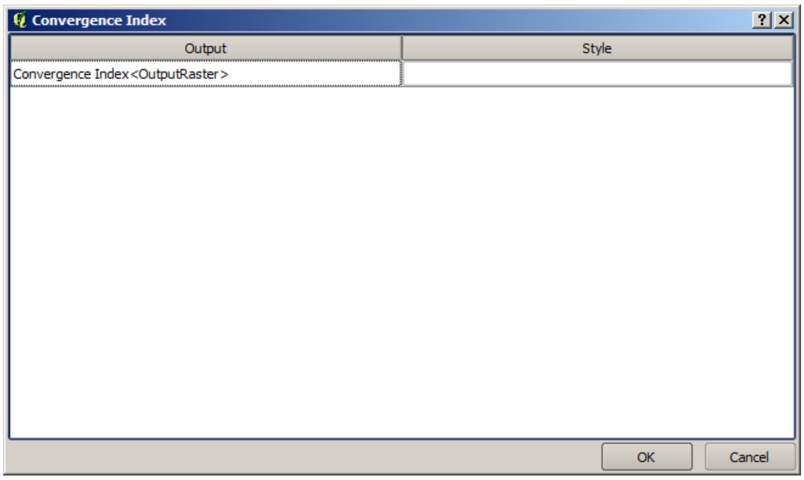
Optional outputs are not supported, so all outputs are created, but you can uncheck the corresponding check box if you are not interested in a given output, which virtually makes it behave like an optional output (although the layer is created anyway, but if you leave the text box empty, it will be saved to a temporary file and deleted once you exit QGIS)

17.2.3 Configuring the processing framework

As it has been mentioned, the configuration menu gives access to a new dialog where you can configure how algorithms work. Configuration parameters are structured in separate blocks that you can select on the left-hand side of the dialog.

Along with the aforementioned *Output folder* entry, the *General* block contains parameters for setting the default rendering style for output layers (that is, layers generated by using algorithms from any of the framework GUI components). Just create the style you want using QGIS, save it to a file, and then enter the path to that file in the settings so the algorithms can use it. Whenever a layer is loaded by SEXTANTE and added to the QGIS canvas, it will be rendered with that style.

Rendering styles can be configured individually for each algorithm and each one of its outputs. Just right-click on the name of the algorithm in the toolbox and select *Edit rendering styles*. You will see a dialog like the one shown next.



Output	Style
Convergence Index<OutputRaster>	

Gambar 17.15: Rendering Styles

Select the style file (`.qml`) that you want for each output and press **[OK]**.

Other configuration parameters in the *General* group are the following ones:

- *Use filename as layer name*. The name of each resulting layer created by an algorithm is defined by the algorithm itself. In some cases, a fixed name might be used, that meaning that the same name will be used, no matter which input layer is used. In other cases, the name might depend on the name of the input layer or some of the parameters used to run the algorithm. If this checkbox is checked, the name will be taken from the output filename instead. Notice, that, if the output is saved to a temporary file, the filename of this temporary file is usually long and meaningless one intended to avoid collision with other already existing filenames.
- *Use only selected features*. If this option is selected, whenever a vector layer is used as input for an algorithm, only its selected features will be used. If the layer has no selected features, all of them will be used.
- *Pre-execution script file* and *Post-execution script file*. This parameters refer to scripts written using the processing scripting functionality, and are explained in the section covering scripting and the console.

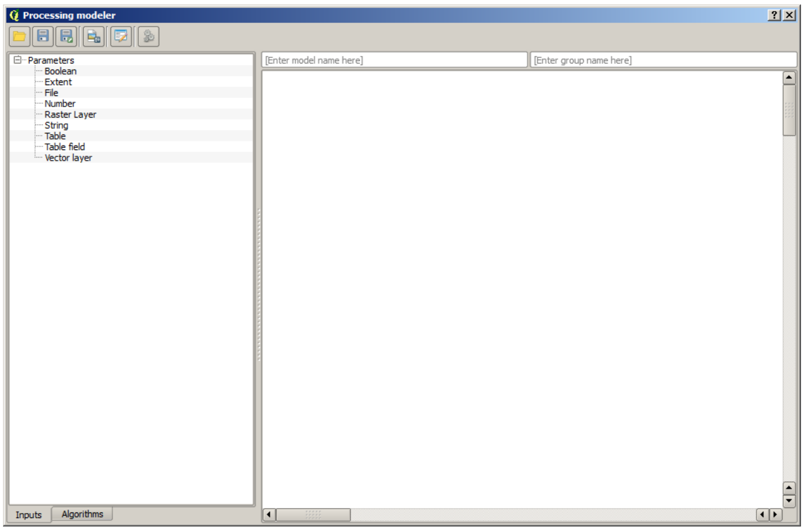
Apart from the *General* block in the settings dialog, you will also find one for each algorithm provider. They contain an *Activate* item that you can use to make algorithms appear or not in the toolbox. Also, some algorithm providers have their own configuration items, that we will explain later when covering particular algorithm providers.

17.3 The graphical modeler

The *graphical modeler* allows to create complex models using a simple and easy-to-use interface. When working with a GIS, most analysis operations are not isolated, but part of a chain of operations instead. Using the graphical modeler, that chain of processes can be wrapped into a single process, so it is easier and more convenient to execute than a single process later on a different set on inputs. No matter how many steps and different algorithms it involves, a model is executed as a single algorithm, thus saving time and effort, specially for larger models.

The modeler can be opened from the processing menu.

The modeler has a working canvas where the structure of the model and the workflow it represents are shown. On the left part of the window, a panel with two tabs can be used to add new elements to the model.



Gambar 17.16: Modeler

Creating a model involves two steps:

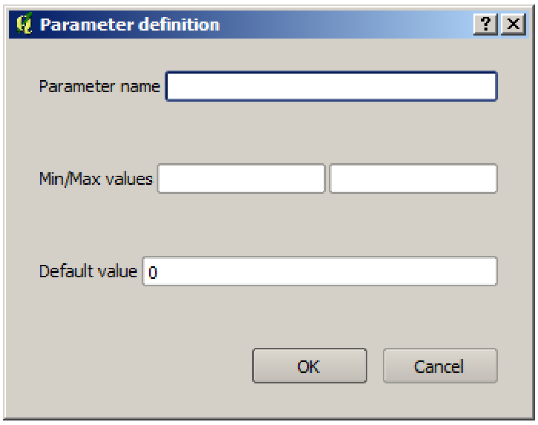
1. *Definition of necessary inputs*. These inputs will be added to the parameters window, so the user can set their values when executing the model. The model itself is an algorithm, so the parameters window is generated automatically as it happens with all the algorithms available in the processign framework.
2. *Definition of the workflow*. Using the input data of the model, the workflow is defined adding algorithms and selecting how they use those inputs or the outputs generated by other algorithms already in the model

17.3.1 Definition of inputs

The first step to create a model is to define the inputs it needs. The following elements are found in the *Inputs* tab on the left side of the modeler window:

- Raster layer
- Vector layer
- String
- Table field
- Table
- Extent
- Number
- Boolean
- File

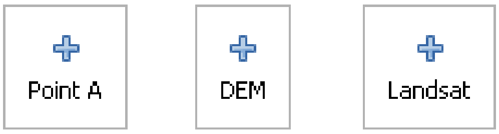
Double-clicking on any of them, a dialog is shown to define its characteristics. Depending on the parameter itself, the dialog will contain just one basic element (the description, which is what the user will see when executing the model) or more of them. For instance, when adding a numerical value, as it can be seen in the next figure, apart from the description of the parameter you have to set a default value and a range of valid values.


Parameter definition
?
Parameter name
Min/Max values
OK
Cancel

Default value 0

Gambar 17.17: Model Parameters

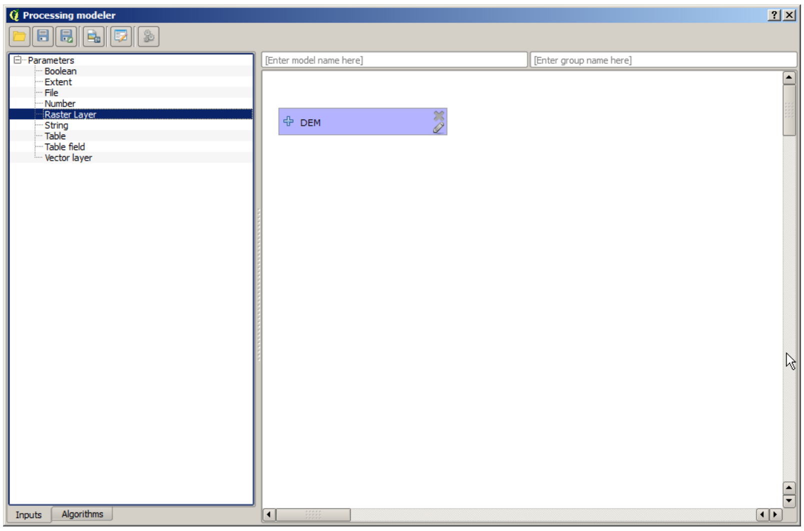
For each added input, a new element is added to the modeler canvas.


Point A
DEM
Landsat

Gambar 17.18: Model Parameters

17.3.2 Definition of the workflow

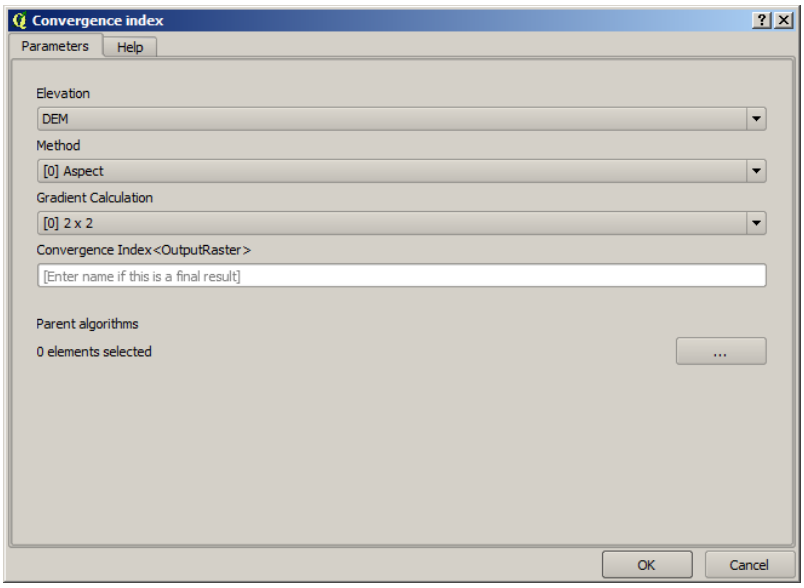
Once the inputs have been defined, it is time to define the algorithms to apply on them. Algorithms can be found in the *Algorithms* tab, grouped much in the same way as they are in the toolbox.


Processing modeler
?
Parameters
Boolean
Extent
File
Number
Raster Layer
String
Table
Table field
Vector layer
[Enter model name here]
[Enter group name here]
DEM
Inputs
Algorithms

Gambar 17.19: Model Parameters

The appearance of the toolbox has two modes here as well: simplified and advanced. However, there is no element to switch between views in the modeler, and you have to do it in the toolbox. The mode that is selected in the toolbox is the one that will be used for the list of algorithms in the modeler.

To add an algorithm to a model, double-click on its name. An execution dialog will appear, with a content similar to the one found in the execution panel that is shown when executing the algorithm from the toolbox. The one shown next correspond to the SAGA ‘Convergence index’ algorithm, the same one we saw in the section dedicated to the toolbox.



Elevation: DEM

Method: [0] Aspect

Gradient Calculation: [0] 2 x 2

Convergence Index<OutputRaster>: [Enter name if this is a final result]

Parent algorithms: 0 elements selected

Gambar 17.20: Model Parameters

As you can see, some differences exist. Instead of the file output box that was used to set the filepath for output layers and tables, a simple text box is. If the layer generated by the algorithm is just a temporary result that will be used as the input of another algorithm and should not be kept as a final result, just do not edit that text box. Typing anything on it means that the result is a final one, and the text that you supply will be the description for the output, which will be the one the user will see when executing the model.

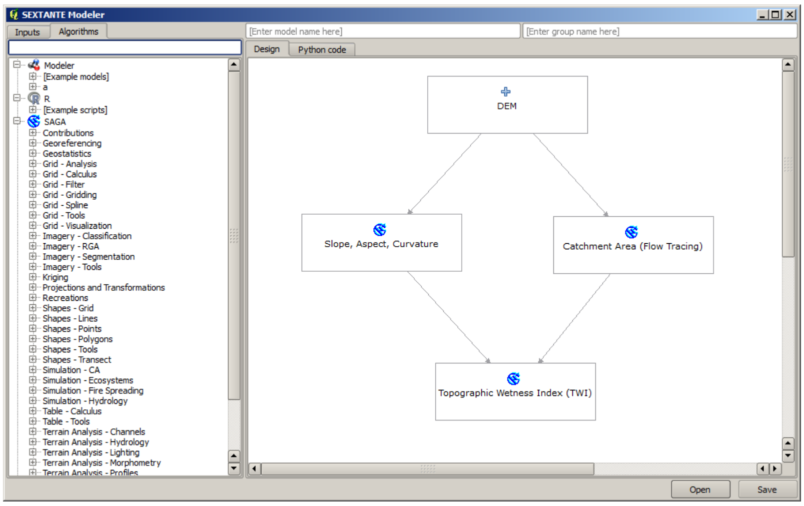
Selecting the value of each parameter is also a bit different, since there are important differences between the context of the modeler and the toolbox one. Let’s see how to introduce the values for each type of parameter.

- Layers (raster and vector) and tables. They are selected from a list, but in this case the possible values are not the layers or tables currently loaded in QGIS, but the list of model inputs of the corresponding type, or other layers or tables generated by algorithms already added to the model.
- Numerical values. Literal values can be introduced directly on the text box. But this text box is also a list that can be used to select any of the numerical value inputs of the model. In this case, the parameter will take the value introduced by the user when executing the model.
- String. Like in the case of numerical values, literal strings can be typed, or an input string can be selected.
- Table field. The fields of the parent table or layer cannot be known at design-time, since they depend of the selection of the user each time the model is executed. To set the value for this parameter, type the name of a field directly in the text box, or use the list to select a table field input already added to the model. The validity of the selected field will be checked at run-time.

In all cases, you will find an additional parameter named *Parent algorithms* that is not available when calling the algorithm from the toolbox. This parameter allows you to define the order in which algorithms are executed, by explicitly defining one algorithm as a parent of the current one, which will force it to be executed before it.

When you use the output of a previous algorithm as the input of your algorithm, that implicitly sets the former as parent of the current one (and places the corresponding arrow in the modeler canvas). However, in some cases an algorithm might depend on another one even if it does not use any output object from it (for instance, and algorithm that executes an SQL sentence on a PostGIS database and another one which imports a layer into that same database) In that case, just select it in the *Parent algorithms* parameter and they will be executed in the correct order.

Once all the parameter have been assigned valid values, click on **[OK]** and the algorithm will be added to the canvas. It will be linked to all the other elements in the canvas, whether algorithms or inputs, which provide objects that are used as inputs for that algorithm.


SEXTANTE Modeler
Inputs
Algorithms
[Enter model name here]
[Enter group name here]
Design
Python code
Modeler
[Example models]
a
R
[Example scripts]
SAGA
Contributions
Georeferencing
Geostatistics
Grid - Analysis
Grid - Calculus
Grid - Filter
Grid - Gridding
Grid - Spline
Grid - Tools
Grid - Visualization
Imagery - Classification
Imagery - RGA
Imagery - Segmentation
Imagery - Tools
Kriging
Projections and Transformations
Recreations
Shapes - Grid
Shapes - Lines
Shapes - Points
Shapes - Polygons
Shapes - Tools
Shapes - Transect
Simulation - CA
Simulation - Ecosystems
Simulation - Fire Spreading
Simulation - Hydrology
Table - Calculus
Table - Tools
Terrain Analysis - Channels
Terrain Analysis - Hydrology
Terrain Analysis - Lighting
Terrain Analysis - Morphometry
Terrain Analysis - Profiles
DEM
Slope, Aspect, Curvature
Catchment Area (Flow Tracing)
Topographic Wetness Index (TWI)
Open
Save

Gambar 17.21: Model Parameters

Elements can be dragged to a different position within the canvas, to change the way the module structure is displayed and make it more clear and intuitive. Links between elements are update automatically.

You can run your algorithm anytime clicking on the **[Run]** button. However, in order to use it from the toolbox, it has to be saved and the modeler dialog closed, to allow the toolbox to refresh its contents.

17.3.3 Saving and loading models

Use the **[Save]** button to save the current model and the **[Open]** one to open any model previously saved. Model are saved with the `.model` extension. If the model has been previously saved from the modeler window, you will not be prompted for a filename, since there is already a file associated with that model, and it will be used.

Before saving a model, you have to enter a name and a group for it, using the text boxes in the upper part of the window.

Models saved on the `models` folder (the default folder when you are prompted for a filename to save the model) will appear in the toolbox in the corresponding branch. When the toolbox is invoked, it searches the `models` folder for files with `.model` extension and loads the models they contain. Since a model is itself an algorithm, it can be added to the toolbox just like any other algorithm.

The models folder can be set from the processing configuration dialog, under the *Modeler* group.

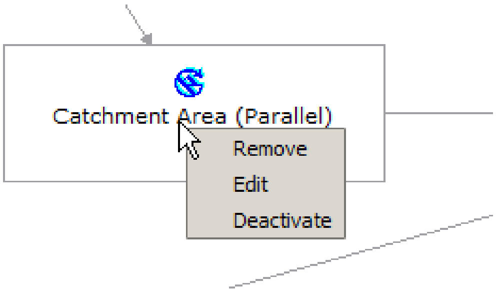
Models loaded from the `models` folder appear not only in the toolbox, but also in the algorithms tree in the *Algorithms* tab of the modeler window. That means that you can incorporate a model as a part of a bigger model, just as you add any other algorithm.

In some cases, a model might not be loaded because not all the algorithms included in its workflow are available. If you have used a given algorithm as part of your model, it should be available (that is, it should appear on the toolbox) in order to load that model. Deactivating an algorithm provider in the processing configuration window renders all the algorithms in that provider unusable by the modeler, which might cause problems when loading models. Keep that in mind when you have trouble loading or executing models.

17.3.4 Editing a model

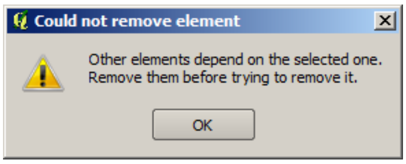
You can edit the model you are currently creating, redefining the workflow and the relationships between the algorithms and inputs that define the model itself.

If you right-click on an algorithm in the canvas representing the model, you will see a context menu like the one shown next:



Gambar 17.22: Modeler Right Click

Selecting the *Remove* option will cause the selected algorithm to be removed. An algorithm can be removed only if there are no other algorithms depending on it. That is, if no output from the algorithm is used in a different one as input. If you try to remove an algorithm that has others depending on it, a warning message like the one you can see below will be shown:


Could not remove element

Other elements depend on the selected one.
Remove them before trying to remove it.

Gambar 17.23: Cannot Delete Algorithm

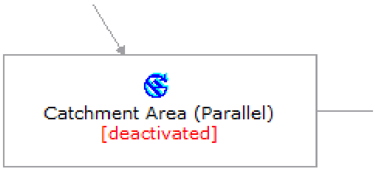
Selecting the *Edit* option or simply double-clicking on the algorithm icon will show the parameters dialog of the algorithm, so you can change the inputs and parameter values. Not all input elements available in the model will appear in this case as available inputs. Layers or values generated at a more advanced step in the workflow defined by the model will not be available if they cause circular dependencies.

Select the new values and then click on the **[OK]** button as usual. The connections between the model elements will change accordingly in the modeler canvas.

17.3.5 Activating and deactivating algorithms

Algorithms can be deactivated in the modeler, so they will not be executed once the model is run. This can be used to test just a given part of the model, or when you do not need all the outputs it generates.

To deactivate an algorithm, right-click on its icon in the model canvas and select the *Deactivate* option. You will see that the algorithm is represented now with a red label under its name indicating that is not active.



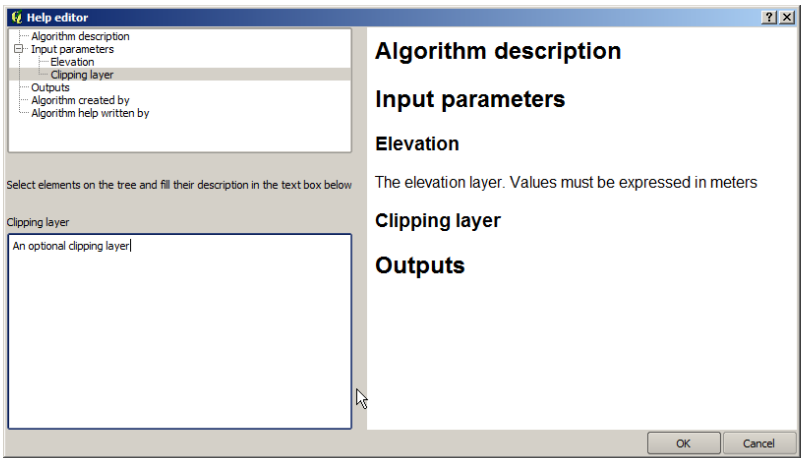
Gambar 17.24: Deactivate

All algorithms depending (directly or undirectly) on that algorithm will also appear as inactive, since they cannot be executed now.

To activate an algorithm, just right–click on its icon and select the *Activate* option.

17.3.6 Editing model help files and meta-information

You can document your models from the modeler itself. Just click on the **[Edit model help]** button and a dialog like the one shown next will appear.



Select elements on the tree and fill their description in the text box below

Clipping layer: An optional clipping layer

Algorithm description

Input parameters

Elevation

The elevation layer. Values must be expressed in meters

Clipping layer

Outputs

Gambar 17.25: Help Edition

On the right-hand side you will see a simple HTML page, created using the description of the input parameters and outputs of the algorithm, along with some additional items like a general description of the model or its author. The first time you open the help editor all those descriptions are empty, but you can edit them using the elements on the left-hand side of the dialog. Select an element on the upper part and the write its description in the text box below.

Model help is saved in a file in the same folder as the model itself. You do not have to worry about saving it, since it is done automatically.

17.3.7 About available algorithms

You might notice that some algorithms that can be be executed from the toolbox do not appear in the list of available ones when you are designing a model. To be included in a model, and algorithm must have a correct semantic, so as to be properly linked to other in the workflow. If an algorithm does not have such well-defined semantic (for instance, if the number of output layers cannot be know in advance), then it is not possible to use it within a model, and thus does not appear in the list of them that you can find in the modeler dialog.

Additionally, you will see some algorithms in the modeler that are not found in the toolbox. This algorithms are meant to be used exclusively as part of a model, and they are of no interest in a different context. The ‘Calculator’ algorithm is an example of that. It is just a simple arithmetic calculator that you can use to modify numerical values (entered by the user or generated by some other algorithm). This tools is really useful within a model, but outside of that context, it doesn’t make too much sense.

17.3.8 Saving models as Python code

Given a model, it is possible to automatically create Python code that performs the same task as the model itself. This code is used to create a console script (we will explain them later in this manual) and you can modify that script to incorporate actions and methods not available in the graphical modeler, such as loops or conditional sentences.

This feature is also a very practical way of learning how to use processign algorithms from the console and how to create new algorithms using Python code, so you can use it as a learning tool when you start creating your own scripts.

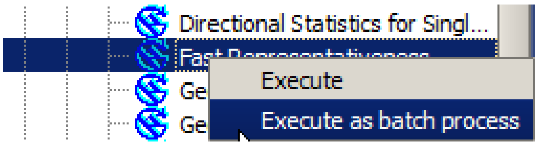
Save your model in the models folder and go to the toolbox, where it should appear now, ready to be run. Right click on the model name and select *Save as Python script* in the context menu that will pop-up. A dialog will prompt you to introduce the file where you want to save the script.

17.4 The batch processing interface

17.4.1 Introduction

All algorithms (including models) can be executed as a batch process. That is, they can be executed using not a single set of inputs, but several of them, executing the algorithm as many times as needed. This is useful when processing large amounts of data, since it is not necessary to launch the algorithm many times from the toolbox.

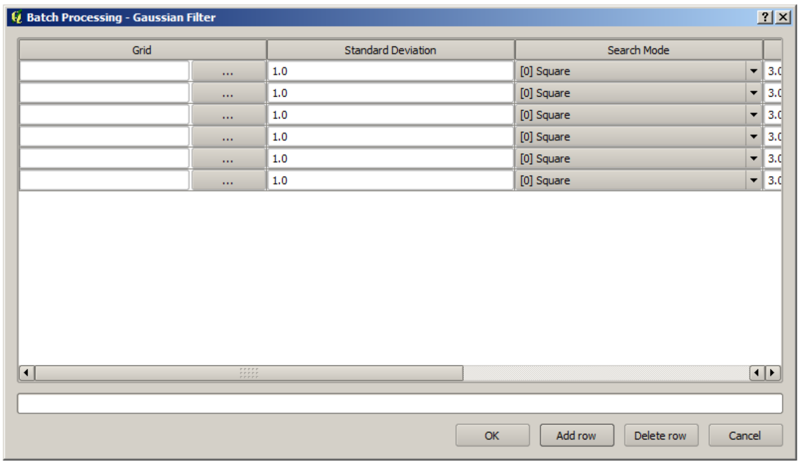
To execute an algorithm as a batch process, right-click on its name in the toolbox and select the *Execute as batch process* option in the pop-up menu that will appear.



Gambar 17.26: Batch Processing Right Click

17.4.2 The parameters table

Executing a batch process is similar to performing a single execution of an algorithm. Parameter values have to be defined, but in this case we need not just a single value for each parameter, but a set of them instead, one for each time the algorithm has to be executed. Values are introduced using a table like the one shown next.



Grid		Standard Deviation	Search Mode	
	...	1.0	[0] Square	3.(
	...	1.0	[0] Square	3.(
	...	1.0	[0] Square	3.(
	...	1.0	[0] Square	3.(
	...	1.0	[0] Square	3.(
	...	1.0	[0] Square	3.(

Gambar 17.27: Batch Processing

Each line of this table represents a single execution of the algorithm, and each cell contains the value of one of the parameters. It is similar to the parameters dialog that you see when executing an algorithm from the toolbox, but with a different arrangement.

By default, the table contains just two rows. You can add or remove rows using the buttons on the lower part of the window.

Once the size of the table has been set, it has to be filled with the desired values.

17.4.3 Filling the parameters table

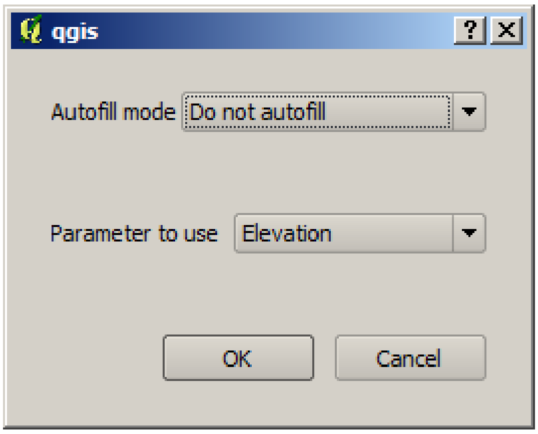
For most parameters, setting its value is trivial. Just type the value or select it from the list of available options, depending on the parameter type.

The main differences are found for parameters representing layers or tables, and for output filepaths. Regarding input layers and tables, when an algorithm is executed as part of a batch process those input data objects are taken directly from files, and not from the set of them already opened in QGIS. For this reason, any algorithm can be executed as a batch process even if no data objects at all are opened and the algorithm cannot be run from the toolbox.

Filenames for input data objects are introduced directly typing or, more conveniently, clicking on the ... button on the right hand of the cell, which shows a typical file chooser dialog. Multiple files can be selected at once. If the input parameter represents a single data object and several files are selected, each one of them will be put in a separate row, adding new ones if needed. If it represents a multiple input, all the selected files will be added to a single cell, separated by semicolons (`;`).

Output data objects are always saved to a file and, unlike when executing an algorithm from the toolbox, saving to a temporary one is not permitted. You can type the name directly or use the file chooser dialog that appears when clicking on the accompanying button.

Once you select the file, a new dialog is shown to allow for autocompletion of other cells in the same column (same parameter).



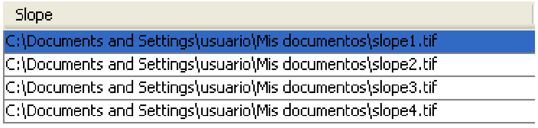
Autofill mode: Do not autofill

Parameter to use: Elevation

Gambar 17.28: Batch Processing Save

If the default value ('Do not autocomplete') is selected, it will just put the selected filename in the selected cell from the parameters table. If any of the other options is selected, all the cells below the selected one will be automatically filled based on a defined criteria. This way, it is much easier to fill the table, and the batch process can be defined with less effort.

Automatic filling can be done simply adding correlative numbers to the selected filepath, or appending the value of another field at the same row. This is particularly useful for naming output data object according to input ones.



Slope
C:\Documents and Settings\usuario\Mis documentos\slope1.tif
C:\Documents and Settings\usuario\Mis documentos\slope2.tif
C:\Documents and Settings\usuario\Mis documentos\slope3.tif
C:\Documents and Settings\usuario\Mis documentos\slope4.tif

Gambar 17.29: Batch Processing File Path

17.4.4 Executing the batch process

To execute the batch process once you have introduced all the necessary values, just click on **[OK]**. Progress of the global batch task will be shown in the progress bar in the lower part of the dialog.

17.5 Using processing algorithms from the console

The console allows advanced users to increase their productivity and perform complex operations that cannot be performed using any of the other GUI elements of the processing framework GUI. Models involving several algorithms can be defined using the command-line interface, and additional operations such as loops and conditional sentences can be added to create more flexible and powerful workflows.

There is not a proccesing console in QGIS, but all processing commands are available instead from the QGIS built-in Python console. That means that you can incorporate those command to your console work and connect processing algorithms to all the other features (including methods from the QGIS API) available from there.

The code that you can execute from the Python console, even if it does not call any specific processing method, can be converted into a new algorithm that you can later call from the toolbox, the graphical modeler or any other component, just like you do with any other algorithm. In fact, some algorithms that you can find in the toolbox are simple scripts.

In this chapter we will see how to use processing algorithms from the QGIS Python console, and also how to write your own algorithms using Python.

17.5.1 Calling algorithms from the Python console

The first thing you have to do is to import the processing functions with the following line:

```
>>> import processing
```

Now, there is basically just one (interesting) thing you can do with that from the console: to execute an algorithm. That is done using the `runalg()` method, which takes the name of the algorithm to execute as its first parameter, and then a variable number of additional parameter depending on the requirements of the algorithm. So the first thing you need to know is the name of the algorithm to execute. That is not the name you see in the toolbox, but rather a unique command–line name. To find the right name for your algorithm, you can use the `algslist()` method. Type the following line in you console:

```
>>> processing.alglist()
```

You will see something like this.

```
Accumulated Cost (Anisotropic)---------------->saga:accumulatedcost(anisotropic)
Accumulated Cost (Isotropic)------------------>saga:accumulatedcost(isotropic)
Add Coordinates to points--------------------->saga:addcoordinatestopoints
Add Grid Values to Points--------------------->saga:addgridvaluestopoints
Add Grid Values to Shapes--------------------->saga:addgridvaluestoshapes
Add Polygon Attributes to Points-------------->saga:addpolygonattributestopoints
Aggregate------------------------------------->saga:aggregate
Aggregate Point Observations------------------>saga:aggregatepointobservations
Aggregation Index----------------------------->saga:aggregationindex
Analytical Hierarchy Process------------------>saga:analyticalhierarchyprocess
Analytical Hillshading------------------------>saga:analyticalhillshading
Average With Mask 1--------------------------->saga:averagewithmask1
Average With Mask 2--------------------------->saga:averagewithmask2
Average With Thereshold 1--------------------->saga:averagewiththereshold1
Average With Thereshold 2--------------------->saga:averagewiththereshold2
Average With Thereshold 3--------------------->saga:averagewiththereshold3
B-Spline Approximation------------------------>saga:b-splineapproximation
...
```

That's a list of all the available algorithms, alphabetically ordered, along with their corresponding command-line names.

You can use a string as a parameter for this method. Instead of returning the full list of algorithm, it will only display those that include that string. If, for instance, you are looking for an algorithm to calculate slope from a DEM, type `alglist("slope")` to get the following result:

```
DTM Filter (slope-based)----------------------->saga:dtmfilter(slope-based)
Downslope Distance Gradient-------------------->saga:downslopedistancegradient
Relative Heights and Slope Positions----------->saga:relativeheightsandslopepositions
Slope Length----------------------------------->saga:slopelength
Slope, Aspect, Curvature----------------------->saga:slopeaspectcurvature
Upslope Area----------------------------------->saga:upslopearea
Vegetation Index[slope based]------------------>saga:vegetationindex[slopebased]
```

This result might change depending on the algorithms you have available.

It is easier now to find the algorithm you are looking for and its command-line name, in this case `saga:slopeaspectcurvature`.

Once you know the command-line name of the algorithm, the next thing to do is to know the right syntax to execute it. That means knowing which parameters are needed and the order in which they have to be passed when calling the `runalg()` method. There is a method to describe an algorithm in detail, which can be used to get a list of the parameters that an algorithms require and the outputs that it will generate. To do it, you can use the `alghelp(name_of_the_algorithm)` method. Use the command-line name of the algorithm, not the full descriptive name.

Calling the method with `saga:slopeaspectcurvature` as parameter, you get the following description.

```
>>> processing.alghelp("saga:slopeaspectcurvature")
ALGORITHM: Slope, Aspect, Curvature
   ELEVATION <ParameterRaster>
   METHOD <ParameterSelection>
   SLOPE <OutputRaster>
   ASPECT <OutputRaster>
   CURV <OutputRaster>
   HCURV <OutputRaster>
   VCURV <OutputRaster>
```

Now you have everything you need to run any algorithm. As we have already mentioned, there is only one single command to execute algorithms: `runalg()`. Its syntax is as follows:

```
>>> processing.runalg(name_of_the_algorithm, param1, param2, ..., paramN,
         Output1, Output2, ..., OutputN)
```

The list of parameters and outputs to add depends on the algorithm you want to run, and is exactly the list that the `alghelp()` method gives you, in the same order as shown.

Depending on the type of parameter, values are introduced differently. The next one is a quick review of how to introduce values for each type of input parameter:

- Raster Layer, Vector Layer or Table. Simply use a string with the name that identifies the data object to use (the name it has in the QGIS Table of Contents) or a filename (if the corresponding layer is not opened, it will be opened, but not added to the map canvas). If you have an instance of a QGIS object representing the layer, you can also pass it as parameter. If the input is optional and you do not want to use any data object, use `None`.
- Selection. If an algorithm has a selection parameter, the value of that parameter should be entered using an integer value. To know the available options, you can use the `algoptions()` command, as shown in the following example:

```
>>> processing.algoptions("saga:slopeaspectcurvature")
METHOD(Method)
    0 - [0] Maximum Slope (Travis et al. 1975)
    1 - [1] Maximum Triangle Slope (Tarboton 1997)
```

```
2 - [2] Least Squares Fitted Plane (Horn 1981, Costa-Cabral & Burgess 1996)
3 - [3] Fit 2.Degree Polynom (Bauer, Rohdenburg, Bork 1985)
4 - [4] Fit 2.Degree Polynom (Heerdegen & Beran 1982)
5 - [5] Fit 2.Degree Polynom (Zevenbergen & Thorne 1987)
6 - [6] Fit 3.Degree Polynom (Haralick 1983)
```

In this case, the algorithm has one of such such parameters, with 7 options. Notice that ordering is zero-based.

- Multiple input. The value is a string with input descriptors separated by semicolons (`;`). As in the case of single layers or tables, each input descriptor can be the data object name, or its filepath.
- Table Field from XXX. Use a string with the name of the field to use. This parameter is case-sensitive.
- Fixed Table. Type the list of all table values separated by commas (`,`) and enclosed between quotes (`"`). Values start on the upper row and go from left to right. You can also use a 2D array of values representing the table.
- CRS. Enter the EPSG code number of the desired CRS.
- Extent. You must use a string with `xmin`, `xmax`, `ymin` and `ymax` values separated by commas (`,`).

Boolean, file, string and numerical parameters do not need any additional explanations.

Input parameters such as strings booleans or numerical values have default values. To use them, use `None` in the corresponding parameter entry.

For output data objects, type the filepath to be used to save it, just as it is done from the toolbox. If you want to save the result to a temporary file, use `None`. The extension of the file determines the file format. If you enter a file extension not included in the ones supported by the algorithm, the default file format for that output type will be used, and its corresponding extension appended to the given filepath.

Unlike when an algorithm is executed from the toolbox, outputs are not added to the map canvas if you execute that same algorithm from the Python Console. If you want to add an output to it, you have to do it yourself after running the algorithm. To do so, you can use QGIS API commands, or, even easier, use one of the handy methods provided for such task.

The `runalg` method returns a dictionary with the output names (the ones shown in the algorithm description) as keys and the filepaths of those outputs as values. You can load those layers by passing its filepath to the `load()` method.

17.5.2 Additional functions for handling data

Apart from the functions used to call algorithms, importing the `processing` package will also import some additional functions that make it easier to work with data, particularly vector data. They are just convenience functions that wrap some functionality from the QGIS API, usually with a less complex syntax. These functions should be used when developing new algorithms, as they make it easier to operate with input data.

Below is a list of some of this commands. More information can be found in the classes under the `processing/tools` package, and aso in the example scripts provided with QGIS.

- `getobject(obj)`: Returns a QGIS object (a layer or table) from the passed object, which can be a filename or the name of the object in the QGIS Table of Contents.
- `values(layer, fields)`: Returns the values in the attributes table of a vector layer, for the passed fields. Fields can be passed as field names or as zero-based field indices. Returns a dict of lists, with the passed field identifiers as keys. It considers the existing selection
- `getfeatures(layer)`: Returns an iterator over the features of a vector layer, considering the existing selection.
- `uniquelabels(layer, field)`: Returns a list of unique values for a given attribute. Attribute can be passed as a field name or a zero-based field index. It considers the existing selection

17.5.3 Creating scripts and running them from the toolbox

You can create your own algorithms by writing the corresponding Python code and adding a few extra lines to supply additional information needed to define the semantics of the algorithm. You can find a *Create new script* menu under the *Tools* group in the *Script* algorithms block of the toolbox. Double-click on it to open the script edition dialog. That's where you should type your code. Saving the script from there in the `scripts` folder (the default one when you open the save file dialog), with `.py` extension, will automatically create the corresponding algorithm.

The name of the algorithm (the one you will see in the toolbox) is created from the filename, removing its extension and replacing low hyphens with blank spaces.

Let's have the following code, which calculates the Topographic Wetness Index (TWI) directly from a DEM

```
##dem=raster
##twi=output
ret_slope = processing.runalg("saga:slopeaspectcurvature", dem, 0, None,
                None, None, None, None)
ret_area = processing.runalg("saga:catchmentarea(mass-fluxmethod)", dem,
                0, False, False, False, False, None, None, None, None, None)
processing.runalg("saga:topographicwetnessindex(twi), ret_slope['SLOPE'],
                ret_area['AREA'], None, 1, 0, twi)
```

As you can see, it involves 3 algorithms, all of them coming from SAGA. The last one of them calculates the TWI, but it needs a slope layer and a flow accumulation layer. We do not have these ones, but since we have the DEM, we can calculate them calling the corresponding SAGA algorithms.

The part of the code where this processing takes place is not difficult to understand if you have read the previous sections in this chapter. The first lines, however, need some additional explanation. They provide the information that is needed to turn your code into an algorithm that can be run from any of the GUI components, like the toolbox or the graphical modeler.

These lines start with a double Python comment symbol (`##`) and have the following structure

```
[parameter_name]=[parameter_type] [optional_values]
```

Here is a list of all the parameter types that are supported in processign scripts, their syntax and some examples.

- `raster`. A raster layer
- `vector`. A vector layer
- `table`. A table
- `number`. A numerical value. A default value must be provided. For instance, `depth=number 2.4`
- `string`. A text string. As in the case of numerical values, a default value must be added. For instance, `name=string Victor`
- `boolean`. A boolean value. Add `True` or `False` after it to set the default value. For example, `verbose=boolean True`
- `multiple raster`. A set of input raster layers.
- `multiple vector`. A set of input vector layers.
- `field`. A field in the attributes table of a vector layer. The name of the layer has to be added after the `field` tag. For instance, if you have declared a vector input with `mylayer=vector`, you could use `myfield=field mylayer` to add a field from that layer as parameter.
- `folder`. A folder
- `file`. A filename

The parameter name is the name that will be shown to the user when executing the algorithm, and also the variable name to use in the script code. The value entered by the user for that parameter will be assigned to a variable with that name.

When showing the name of the parameter to the user, the name will be edited it to improve its appearance, replacing low hyphens with spaces. So, for instance, if you want the user to see a parameter named `A numerical value`, you can use the variable name `A_numerical_value`.

Layers and tables values are strings containing the filepath of the corresponding object. To turn them into a QGIS object, you can use the `processing.getObjectFromUri()` function. Multiple inputs also have a string value, which contains the filepaths to all selected object, separated by semicolons (`;`).

Outputs are defined in a similar manner, using the following tags:

- `output raster`
- `output vector`
- `output table`
- `output html`
- `output file`
- `output number`
- `output string`

The value assigned to the output variables is always a string with a filepath. It will correspond to a temporary filepath in case the user has not entered any output filename.

When you declare an output, the algorithm will try to add it to QGIS once it is finished. That is the reason why, although the `runalg()` method does not load the layers it produces, the final TWI layer will be loaded, since it is saved to the file entered by the user, which is the value of the corresponding output.

Do not use the `load()` method in your script algorithms, but just when working with the console line. If a layer is created as output of an algorithm, it should be declared as such. Otherwise, you will not be able to properly use the algorithm in the modeler, since its syntax (as defined by the tags explained above) will not match what the algorithm really creates.

Hidden outputs (numbers and strings) do not have a value. Instead, it is you who has to assign a value to them. To do so, just set the value of a variable with the name you used to declare that output. For instance, if you have used this declaration,

```
##average=output number
```

the following line will set the value of the output to 5:

```
average = 5
```

In addition to the tags for parameters and outputs, you can also define the group under which the algorithm will be shown, using the `group` tag.

If you algorithm takes a long time to process, it is a good idea to inform the user. You have a global named `progress` available, with two available methods: `setText(text)` and `setPercentage(percent)` to modify the progress text and the progress bar.

Several examples are provided. Please, check them to see real examples of how to create algorithms using the processing framework classes. You can right-click on any script algorithm and select *Edit script* to edit its code or just to see it.

17.5.4 Documenting your scripts

As in the case of models, you can create additional documentation for your script, to explain what they do and how to use them. In the script editing dialog you will find a **[Edit script help]** button. Click on it and it will take you to the help editing dialog. Check the chapter about the graphical modeler to know more about this dialog and how to use it.

Help files are saved in the same folder as the script itself, adding the `.help` extension to the filename. Notice that you can edit your script's help before saving it for the first time. If you later close the script editing dialog without saving the script (i.e. you discard it), the help content you wrote will be lost. If your script was already saved and is associated to a filename, saving is done automatically.

17.5.5 Pre- and post-execution script hooks

Scripts can also be used to set pre- and post-execution hooks that are run before and after an algorithm is run. This can be used to automate tasks that should be performed whenever an algorithm is executed.

The syntax is identical to the syntax explained above, but an additional global variable named `alg` is available, representing the algorithm that has just been (or is about to be) executed.

In the *General* group of the processing config dialog you will find two entries named *Pre-execution script file* and *Post-execution script file* where the filename of the scripts to be run in each case can be entered.

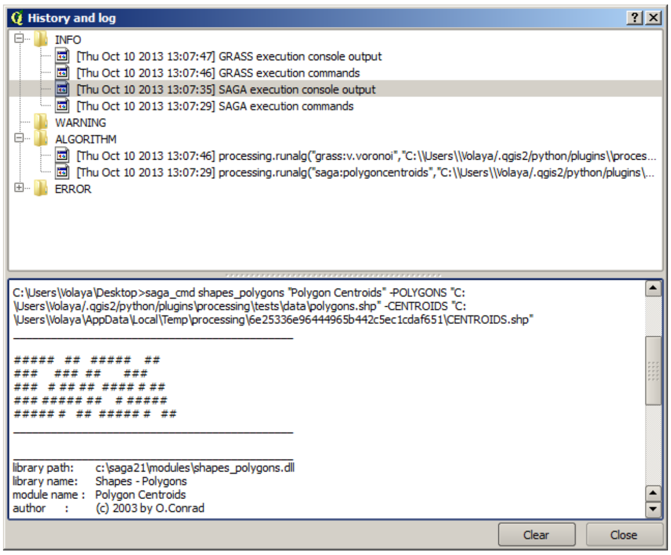
17.6 The history manager

17.6.1 The processing history

Every time you execute an algorithm, information about the process is stored in the history manager. Along with the parameters used, the date and time of the execution are also saved.

This way, it is easy to track the and control all the work that has been developed using the processing framework, and easily reproduce it.

The history manager is a set of registry entries grouped according to their date of execution, making it easier to find information about an algorithm executed at any particular moment.



```
INFO
    [Thu Oct 10 2013 13:07:47] GRASS execution console output
    [Thu Oct 10 2013 13:07:46] GRASS execution commands
    [Thu Oct 10 2013 13:07:35] SAGA execution console output
    [Thu Oct 10 2013 13:07:29] SAGA execution commands
WARNING
ALGORITHM
    [Thu Oct 10 2013 13:07:46] processing.runalg("grass:v.voronoi","C:\\Users\\Volaya/.qgis2/python/plugins\\proces...
    [Thu Oct 10 2013 13:07:29] processing.runalg("saga:polygoncentroids","C:\\Users\\Volaya/.qgis2/python/plugins\...
ERROR
```

```
C:\Users\Volaya\Desktop>saga_cmd shapes_polygons "Polygon Centroids" -POLYGONS "C:
\Users\Volaya/.qgis2/python/plugins\processing\tests\data\polygons.shp" -CENTROIDS "C:
\Users\Volaya\AppData\Local\Temp\processing\6e25336e96444965b442c5ec1cdaf651\CENTROIDS.shp"
_____________________________________________

#####  ##  #####  ##
###   ### ##    ###
###  # ## ## #### # ##
### ##### ##   # #####
##### #  ## ##### #  ##
_____________________________________________

_____________________________________________
library path:	c:\saga21\modules\shapes_polygons.dll
library name:	Shapes - Polygons
module name :	Polygon Centroids
author     :	(c) 2003 by O.Conrad
```

Gambar 17.30: History

Process information is kept as a command-line expression, even if the algorithm was launched from the toolbox. This makes it also useful for those learning how to use the command-line interface, since they can call an algorithm using the toolbox and then check the history manager to see how that same algorithm could be called from the command line.

Apart from browsing the entries in the registry, processes can be re-executed, simply double-clicking on the corresponding entry.

Along with algorithm executions, the processing framework communicates with the user using the other groups of the registry, namely *Errors*, *Warnings* and *Information*. In case something is not working properly, having a look at the *Errors* might help you to see what is happening. If you get in contact with a developer to report a bug or error, the information in that group will be very useful for him to find out what is going wrong.

When executing third party algorithms, this is usually done calling their command-line interfaces, which communicate with the user using the console. Although that console is not shown, a full dump of it is stored in the *Information* group each time you run one of those algorithms. If, for instance, you are having problems executing a SAGA algorithm, look for an entry name 'SAGA execution console output' to check all the messages generated by SAGA and try to find out where the problem is.

Some algorithms, even if they can produce a result with the given input data, might add comments or additional information to *Warning* block in case they detect potential problems from that data, in order to warn you about them. Make sure you check those messages in case you are having unexpected results.

17.7 Configuring external applications

The processign framework can be extended using additional applications. Currently, SAGA, GRASS, OTB(Orfeo Toolbox) and R are supported, along with some other command-line applications that provide spatial data analysis functionalities. Algorithms relying on an external application are managed by their own algorithm provider.

This chapter will show you how to configure the processing framework to include these additional applications, and will explain some particular features of the algorithm based on them. Once you have correctly configured the system, you will be able to execute external algorithms from any component like the toolbox or the graphical modeler, just like you do with any other geoalgorithm.

By default, all algorithms that rely on an external appplication not shipped with QGIS are not enabled. You can enable them in the configuration dialog. Make sure that the corresponding application is already installed in your system. Enabling an algorithm provider without installing the application it needs will cause the algorithms to appear in the toolbox, but an error will be thrown when you try to execute them.

This is because the algorithm descriptions (needed to create the parameters dialog and provide the information needed about the algorithm) are not included with each application, but with QGIS instead. That is,they are part of QGIS, so you have them in your installation even if you have not installed any other software. Running the algorithm, however, needs the application binaries to be installed in your system.

17.7.1 A note for Windows users

If you are not an advanced user and you are running QGIS on windows, you might not be interested in reading the rest of this chapter. Make sure you install QGIS in your system using the OSGeo4W application. That will automatically install SAGA, GRASS and OTB in your system, and configure them so they can be run from QGIS. All the algorithms in the simplified view of the toolbox will be ready to be run, without needing any further configuration.

If you want to know more about how these providers work, or want to use some algorithms not included in the simplified toolbox (such as R scripts), keep on reading.

17.7.2 A note on file formats

When using an external software, opening a file in QGIS does not mean that it can be opened and processed as well on that other software. In most cases, it can read what you have opened in QGIS, but in some cases, that might not be the case. When using databases or uncommon file formats, whether for raster of vector layers, problems might arise. If that happens, try to use well known file formats that you are sure that are understood by both programs, and check to console output (in the history and log dialog) for knowing more about what is going wrong.

Using GRASS raster layers is, for instance, one case in which you might have trouble and not be able to complete your work if you call an external algorithm using such a layer as input. For this reason, these layers will not appear as available to algorithms.

You should, however, find no problems at all with vector layers, since QGIS automatically converts from the original file format to one accepted by the external application before passing the layer to it. This adds an extra processing time, which might be significant if the layer has a large size, so do not be surprised if it takes more to process a layer from a DB connection that one of a similar size stored in a shapefile.

Providers not using external applications can process any layer that you can open in QGIS, since they open it for analysis through QGIS.

Regarding output formats, all formats supported by QGIS as output can be used, both for raster and vector layers. Some provider do not support certain formats, but all can export to common formats raster layers that can be later transformed by QGIS automatically. As in the case of input layers, if this conversion is needed, that might increase the processing time.

If the extension of the filename specified when calling an algorithm does not match the extension of any of the formats supported by QGIS, then a suffix will be added to set a default format. In the case of raster layers, the `tif` extension is used, while `shp` is used for vector layer.

17.7.3 A note on vector layer selections

External applications are also aware of the selection that exist in vector layers within QGIS. However, that requires rewritting all input vector layers, just as if they were originally in a format not supported by the external application. Only when no selection exist, or the *Use only selected features* option is not enabled in the processing general configuration, a layer can be directly passed to an external application.

In other cases, exporting only selected features is needed, which causes execution times to be longer.

SAGA

SAGA algorithms can be run from QGIS if you have SAGA installed in your system and you configure the processing framework properly so it can find SAGA executables. In particular, the SAGA command-line executable is needed to run SAGA algorithms.

In case of running Windows, the standalone installer or the OSGeo4W installer, both install SAGA along with QGIS, and the path is automatically configured, so there is no need to do anything else.

If you have installed SAGA yourself (remember, you need version 2.1), the path to the SAGA executable must be configured. To do it, open the configuration dialog. In the *SAGA* block you will find a setting named *SAGA Folder*. Enter the path to the folder where SAGA is installed. Close the configuration dialog and now you are ready to run SAGA algorithms from QGIS.

In case you are running linux, SAGA binaries are not included with SEXTANTE, so you have to download and install the software yourself. Please check the SAGA website for more information. SAGA 2.1 is needed.

In this case there is no need to configure that, and you will not see those folders. Instead, you must make sure that SAGA is properly installed and its folder is added to the PATH environment variable. Just open a console and type `saga_cmd` to check that the system can find where SAGA binaries are located.

17.7.4 About SAGA grid system limitations

Most of SAGA algorithms that require several input raster layers, require them to have the same grid system. That is, to cover the same geographic area and have the same cellsize, so their corresponding grids match. When calling SAGA algorithms from QGIS, you can use any layer, regardless of its cellsize and extent. When multiple raster layers are used as input for a SAGA algorithm, QGIS resamples them to a common grid system and then passes them to SAGA (unless the SAGA algorithm can operate with layers from different grid systems).

The definition of that common grid system is controlled by the user, and you will find several parameters in the SAGA group of the setting window to do so. There are two ways of setting the target grid system:

- Setting it manually. You define the extent setting the values of the following parameters:
  - *Resampling min X*
  - *Resampling max X*

  - *Resampling min Y*
  - *Resampling max Y*
  - *Resampling cellsize*

  Notice that QGIS will resample input layers to that extent, even if they do not overlap with it.

- Setting it automatically from input layers. To select this option, just check the *Use min covering grid system for resampling* option. All the other settings will be ignored and the minimum extent that covers all the input layers will be used. The cellsize of the target layer is the maximum of all cellsizes of the input layers.

For algorithms that do not use multiple raster layers, or for those that do not need a unique input grid system, no resampling is performed before calling SAGA, and those parameters are not used.

17.7.5 Limitations for multi-band layers

Unlike QGIS, SAGA has no support for multi-band layers. If you want to use a multiband layer (such as an RGB or multispectral image), you first have to split it into single-banded images. To do so, you can use the 'SAGA/Grid - Tools/Split RGB image' algorithm (which creates 3 images from an RGB image) or the 'SAGA/Grid - Tools/Extract band' algorithm (to extract a single band).

17.7.6 Limitations in cellsize

SAGA assumes that raster layers have the same cellsize in the X and Y axis. If you are working with a layer with different values for its horizontal and vertical cellsizes, you might get unexcepted results. In this case, a warning will be added to the processing log, indicating that an input layer might not be suitable to be processed by SAGA.

17.7.7 Logging

When QGIS calls SAGA, it does it using its command-line interface, thus passing a set of commands to perform all the required operation. SAGA show its progress by writing information to the console, which includes the percentage of processing already done, along with additional content. This output is filtered and used to update the progress bar while the algorithm is running.

Both the commands sent by QGIS and the additional information printed by SAGA can be logged along with other processing log messages, and you might find them useful to track in detailed what is going on when QGIS runs a SAGA algorithm. you will find two settings, namely *Log console output* and *Log execution commands* to activate that logging mechanism.

Most other providers that use an external application and call it through the command-line have similar options, so you will find them as well in other places in the processing settings list.

R. Creating R scripts

R integration in QGIS is different from that of SAGA in that there is not a predefined set of algorithms you can run (except for a few examples). Instead, you should write your scripts and call R commands, much like you would do from R, and in a very similar manner to what we saw in the chapter dedicated to processing scripts. This chapter shows you the syntax to use to call those R commands from QGIS and how to use QGIS objects (layers, tables) in them.

The first thing you have to do, as we saw in the case of SAGA, is to tell QGIS where you R binaries are located. You can do so using the *R folder* entry in the processing configuration dialog. Once you have set that parameter, you can start creating your own R scripts and executing them.

Once again, this is different in Linux, and you just have to make sure that the R folder is included in the PATH environment variable. If you can start R just typing `R` in a console, then you are ready to go.

To add a new algorithm that calls an R function (or a more complex R script that you have developed and you would like to have available from QGIS), you have to create a script file that tells the processing framework how to perform that operation and the corresponding R commands to do so.

Script files have the extension `.rsx` and creating them is pretty easy if you just have a basic knowledge of R syntax and R scripting. They should be stored in the R-scripts folder. You can set this folder in the *R* settings group (available from the processing settings dialog), just like you do with the folder for regular processing scripts.

Let's have a look at a very simple file script file, which calls the R method `spsample` to create a random grid within the boundary of the polygons in a given polygon layer. This method belong to the `maptools` package. Since almost all the algorithms that you might like to incorporate into QGIS will use or generate spatial data, knowledge of spatial packages like `maptools` and, specially, `sp`, is mandatory.

```
##polyg=vector
##numpoints=number 10
##output=output vector
##sp=group
pts=spsample(polyg,numpoints,type="random")
output=SpatialPointsDataFrame(pts, as.data.frame(pts))
```

The first lines, which start with a double Python comment sign (`##`), tell QGIS the inputs of the algorithm described in the file and the outputs that it will generate. They work exactly with the same syntax as the SEXTANTE scripts that we have already seen, so they will not be described here again. Check the *processing_scripts* section for more information.

When you declare an input parameter, QGIS uses that information for two things: creating the user interface to ask the user for the value of that parameter and creating a corresponding R variable that can be later used as input for R commands.

In the above example, we are declaring an input of type `vector` named `polyg`. When executing the algorithm, QGIS will open in R the layer selected by the user and store it in a variable also named `polyg`. So the name of a parameter is also the name of the variable that we can use in R for accesing the value of that parameter (thus, you should avoid using reserved R words as parameter names).

Spatial elements such as vector and raster layers are read using the `readOGR()` and `brick()` commands (you do not have to worry about adding those commands to your description file, QGIS will do it) and stored as `Spatial*DataFrame` objects. Table fields are stored as strings containing the name of the selected field.

Tables are opened using the `read.csv()` command. If a table entered by the user is not in CSV format, it will be converted prior to importing it in R.

Additionally, raster files can be read using the `readGDAL()` command instead of `brick()`, by using the `##usereadgdal`.

If you are an advanced user and do not want QGIS to create the object representing the layer, you can use the `##passfilename` tag to indicate that you prefer a string with the filename instead. In this case, it is up to you to open the file before performing any operation on the data it contains.

With the above information, we can now understand the first line of our first example script (the first line not starting with a Python comment).

```
pts=spsample(polyg,numpoints,type="random")
```

The variable `polygon` already contains a `SpatialPolygonsDataFrame` object, so it can be used to call the `spsample` method, just like the `numpoints` one, which indicates the number of points to add to the created sample grid.

Since we have declared an output of type vector named `out`, we have to create a variable named `out` and store a `Spatial*DataFrame` object in it (in this case, a `SpatialPointsDataFrame`). You can use any name for your intermediate variables. Just make sure that the variable storing your final result has the same name that you used to declare it, and contains a suitable value.

In this case, the result obtained from the `spsample` method has to be converted explicitly into a `SpatialPointsDataFrame` object, since it is itself an object of class `ppp`, which is not a suitable class to be returned to QGIS.

If your algorithm generates raster layers, the way they are saved will depend on whether you have used or not the `#dontuserasterpackage` option. In you have used it, layers are saved using the `writeGDAL()` method. If not, the `writeRaster()` method from the `raster` package will be used.

If you have used the `#passfilename` option, outputs are generated using the `raster` package (with `writeRaster()`), even though it is not used for the inputs.

If you algorithm does not generate any layer, but a text result in the console instead, you have to indicate that you want the console to be shown once the execution is finished. To do so, just start the command lines that produce the results you want to print with the > ('greater') sign. The output of all other lines will not be shown. For instance, here is the description file of an algorithm that performs a normality test on a given field (column) of the attributes of a vector layer:

```
##layer=vector
##field=field layer
##nortest=group
library(nortest)
>lillie.test(layer[[field]])
```

The output ot the last line is printed, but the output of the first is not (and neither are the outputs from other command lines added automatically by QGIS).

If your algorithm creates any kind of graphics (using the `plot()` method), add the following line:

```
##showplots
```

This will cause QGIS to redirect all R graphical outputs to a temporary file, which will be later opened once R execution has finished.

Both graphics and console results will be shown in the processing results manager.

For more information, please check the script files provided with SEXTANTE. Most of them are rather simple and will greatly help you understand how to create your own ones.

Catatan: `rgdal` and `maptools` libraries are loaded by default so you do not have to add the corresponding `library()` commands (you have to make sure, however, that those two packages are installed in your R distribution). However, other additional libraries that you might need have to be explicitly loaded. Just add the necessary commands at the beginning of your script. You also have to make sure that the corresponding packages are installed in the R distribution used by QGIS. The processing framework will not take care of any package installation. If you run a script that requires an uninstalled package, the execution will fail, and SEXTANTE will try to detect which packages are missing. You must install those missing libraries manually before you can run the algorithm.

GRASS

Configuring GRASS is not much different from configuring SAGA. First, the path to the GRASS folder has to be defined, but only if you are running Windows. Additionaly, a shell interpreter (usually `msys.exe`, which can be found in most GRASS for Windows distributions) has to be defined and its path set up as well.

By default, the processign framework tries to configure its GRASS connector to use the GRASS distribution that ships along with QGIS. This should work without problems in most systems, but if you experience problems, you might have to do it manually. Also, if you want to use a different GRASS installation, you can change that setting and point to the folder where that it is installed. GRASS 6.4 is needed for algorithms to work correctly.

If you are running Linux, you just have to make sure that GRASS is correctly installed, and that it can be run without problem from a console.

GRASS algorithms use a region for calculations. This region can be defined manually using values similar to the ones found in the SAGA configuration, or automatically, taking the minimum extent that covers all the input layers used to execute the algorithm each time. If this is the behaviour you prefer, just check the *Use min covering region* option in the GRASS configuration parameters.

The last parameter that has to be configured is related to the mapset. A mapset is needed to run GRASS, and the processing frmaework creates a temporary one for each execution. You have to specify if the data you are working with uses geographical (lat/lon) coordinates or projected ones.

GDAL

No additional configuration is needed to run GDAL algorithms, since it is already incorporated to QGIS and algorithms can infere its configuration from it.

Orfeo ToolBox

Orfeo ToolBox (OTB) algorithms can be run from QGIS if you have OTB installed in your system and you have configured QGIS properly, so it can find all necessary files (command-line tools and libraries).

As in the case of SAGA OTB binaries are included in the standalone installer for Windows, but are not included if you are runing Linux, so you have to download and install the software yourself. Please check the OTB website for more information.

Once OTB is installed, start QGIS, open the processing configuration dialog and configure the OTB algorithm provider. In the *Orfeo Toolbox (image analysis)* block you will find all settings related to OTB. First ensure that algorithms are enabled.

Then configure the path to the folder where OTB command–line tools and libraries are installed:

- 🐧 usually *OTB applications folder* point to `/usr/lib/otb/applications` and *OTB command line tools folder* is `/usr/bin`
- ⊞ if you use OSGeo4W installer, than install `otb-bin` package and enter `C:\OSGeo4W\apps\orfeotoolbox\applications` as *OTB applications folder* and `C:\OSGeo4W\bin` as *OTB command line tools folder*. This values should be configured by default, but if you have a different OTB installation, configure them to the correspondig values in your system.

TauDEM

To use this provider you need to install TauDEM command line tools.

17.7.8 Windows

Please visit TauDEM homepage for installation instructions and precompiled binaries for 32bit and 64bit systems. **IMPORTANT**: you need TauDEM 5.0.6 executables, version 5.2 is currently not supported.

17.7.9 Linux

There are no packages for most Linux distribution, so you should compile TauDEM by yourself. As TauDEM uses MPICH2, first install it using your favorite package manager. Also TauDEM works fine with OpenMPI, so you can use it instead of MPICH2.

Download TauDEM 5.0.6 source code and extract files in some folder.

Open `linearpart.h` file and add after line

```
#include "mpi.h"
```

add new line with

```
#include <stdint.h>
```

so you'll get

```
#include "mpi.h"
#include <stdlib.h>
```

Save changes and close file. Now open `tiffIO.h`, find line `#include "stdint.h"` and replace quotes (`""`) with `<>`, so you'll get

```
#include <stdint.h>
```

Save changes and close file. Create build directory and cd into it

```
mkdir build
cd build
```

Configure your build with command

```
CXX=mpicxx cmake -DCMAKE_INSTALL_PREFIX=/usr/local ..
```

and then compile

```
make
```

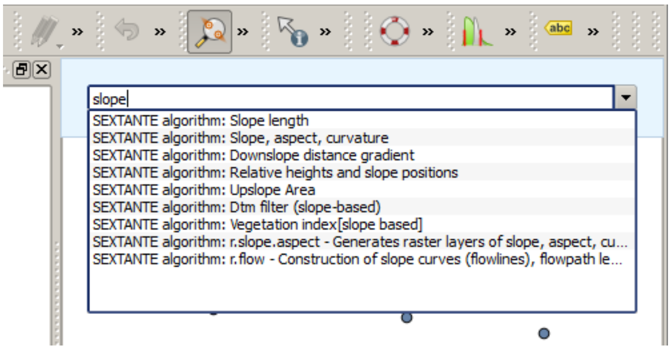
Finaly, to install TauDEM into `/usr/local/bin`, run

```
sudo make install
```

17.8 The SEXTANTE Commander

SEXTANTE includes a practical tool that allows you to run algorithms without having to use the toolbox, but just typing the name of the algorithm you want to run.

This tools is known as the *SEXTANTE commander*, and it is just a simple text box with autocompletion where you type the command you want to run.



slope

SEXTANTE algorithm: Slope length
SEXTANTE algorithm: Slope, aspect, curvature
SEXTANTE algorithm: Downslope distance gradient
SEXTANTE algorithm: Relative heights and slope positions
SEXTANTE algorithm: Upslope Area
SEXTANTE algorithm: Dtm filter (slope-based)
SEXTANTE algorithm: Vegetation index[slope based]
SEXTANTE algorithm: r.slope.aspect - Generates raster layers of slope, aspect, cu...
SEXTANTE algorithm: r.flow - Construction of slope curves (flowlines), flowpath le...

Gambar 17.31: The SEXTANTE Commander

The commander is started from the *Analysis* menu or, more practically, pressing `Shift + Ctrl + M` (you can change that default keyboard shortcut in the QGIS configuration if you prefer a different one). Apart from executing SEXTANTE algorithms, the commander gives you access to most of the functionality in QGIS, which means that it gives you a practical and efficient way of running QGIS tasks, and allows you to control QGIS reducing the usage of buttons and menus.

Moreover, the commander is configurable and you can add your custom commands and have them just a few keystrokes away, making it a powerful tool to become more productive in your daily work with QGIS

17.8.1 Available commands

The commands available in the commander fall in the following categories:

- SEXTANTE algorithms. They are shown as `SEXTANTE algorithm: <name of the algorithm>`.
- Menu items. They are shown as `Menu item: <menu entry text>`. All menus items available from the QGIS interface are available, even if they are included in a submenu.
- Python functions. You can create short Python functions that will be then included in the list of available commands. They are shown as `Function: <function name>`

To run any of the above, just start typing and then select the corresponding element from the list of available ones that appears after filtering the whole list of commands with the text you have entered.

In the case of calling a Python function, you can select the entry in the list, which is prefixed by `Function:` (for instance, `Function: removeall), or just directly type the function name (``removeall` in the previous example). There is no need to add brackets after the function name.

17.8.2 Creating custom functions

Custom functions are added by entering the corresponding Python code in the `commands.py` file that is found in the `.qgis/sextante/commander directory` in your user folder. It is just a simple Python file where you can add the functions that you need.

The file is created the first time you open the commander, with a few example functions. If you haven't launched the commander yet, you can create the file yourself. To edit the commands file, use your favorite text editor. You can also use a built-in editor by calling the `edit` command from the commander. It will open the editor with the commands file, and you can edit it directly and then save your changes.

For instance, you can add the following function, which removes all layers:

```python
from qgis.gui import *

def removeall():
    mapreg = QgsMapLayerRegistry.instance()
    mapreg.removeAllMapLayers()
```

Once you have added the function, it will be available in the commander, and you can invoke it by typing `removeall`. There is no need to do anything apart from writing the function itself.

Functions can receive parameters. Add `*args` to your function definition, to receive argument. When calling the function from the commander, parameters have to be passed separated by spaces.

Here is an example of a function that loads a layer and takes a parameter with the filename of the layer to load.

```python
import sextante

def load(*args):
  sextante.load(args[0])
```

If you want to load a layer in `/home/myuser/points.shp`, type `load /home/myuser/points.shp` in the commander text box.

BAB 18

Print Composer

The print composer provides growing layout and printing capabilities. It allows you to add elements such as the QGIS map canvas, text labels, images, legends, scalebars, basic shapes, arrows, attribute tables and HTML frames. You can size, group, align and position each element and adjust the properties to create your layout. The layout can be printed or exported to image formats, Postscript, PDF or to SVG (export to SVG is not working properly with some recent Qt4 versions, you should try and check individual on your system). You can save the layout as template and load it again in another session. Finally, generating several maps based on a template can be done throught the Atlas generator See a list of tools in table_composer_1:

Icon	Purpose	Icon	Purpose
	Save Project		New Composer
	Duplicate Composer		Composer Manager
	Load from template		Save as template
	Export to an image format		Export as PDF
	Export print composition to SVG		Print or export as Postscript
	Zoom to full extent		Zoom in
	Zoom out		Refresh view
	Revert last change		Restore last change
	Add new map from QGIS map canvas		Add image to print composition
	Add label to print composition		Add new legend to print composition
	Add new scalebar to print composition		Add basic shape to print composition
	Add arrow to print composition		Add attribute table to print composition
	Add a HTML Frame		
	Select/Move item in print composition		Move content within an item
	Group items of print composition		Ungroup items of print composition
	Raise selected items		Lower selected items
	Move selected items to top		Move selected items to bottom
	Align selected items left		Align selected items right
	Align selected items center		Align selected items center vertical
	Align selected items top		Align selected items bottom

Table Composer 1: Print Composer Tools

All Print Composer tools are available in menus and as icons in a toolbar. The toolbar can be switched off and on using the right mouse button over the toolbar.

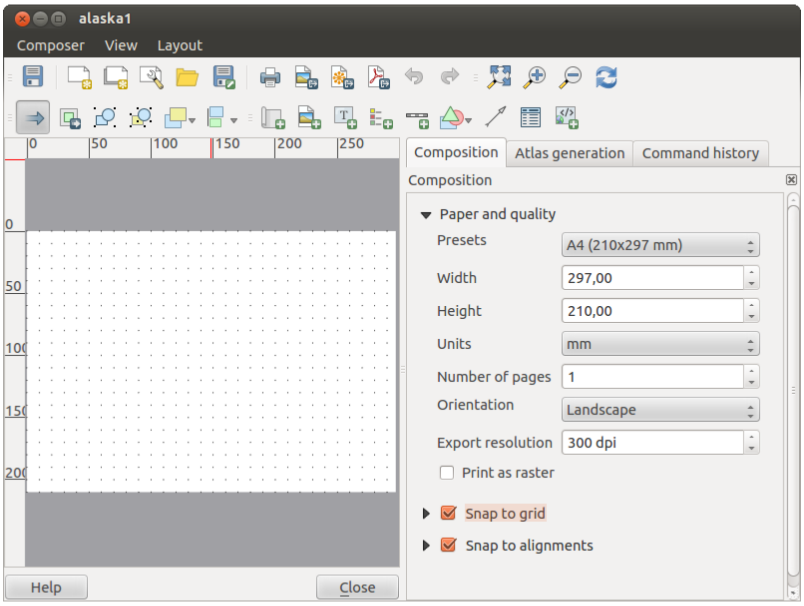
18.1 First steps

18.1.1 Open a new Print Composer Template

Before you start to work with the print composer, you need to load some raster and vector layers in the QGIS map canvas and adapt their properties to suit your own convenience. After everything is rendered and symbolized to your liking, click the New Print Composer icon in the toolbar or choose *File* → *New Print Composer*. You will be prompt to choose a title for the new composer.

18.1.2 Using Print Composer

Opening the print composer provides you with a blank canvas to which you can add the current QGIS map canvas, text labels, images, legends, scalebars, basic shapes, arrows, attribute tables and HTML frames. Figure_composer_1 shows the initial view of the print composer with an activated ☑ *Snap to grid* mode but before any elements are added.



Paper and quality
Presets A4 (210x297 mm)
Width 297,00
Height 210,00
Units mm
Number of pages 1
Orientation Landscape
Export resolution 300 dpi
☐ Print as raster
☑ Snap to grid
☑ Snap to alignments

Gambar 18.1: Print Composer

The print composer provides four tabs:

- The *Composition* tab allows you to set paper size, orientation, the print quality for the output file in dpi and to activate snapping to a grid of a defined resolution. You can also choose the *Number of pages* your composition will have. Please note, the ☑ *Snap to grid* feature only works, if you define a grid resolution > 0. Furthermore you can also activate the ☑ *Print as raster* checkbox. This means all elements will be rastered before printing or saving as Postscript or PDF.
- The *Item Properties* tab displays the properties for the selected item element. Click the Select/Move item icon to select an element (e.g. legend, scalebar or label) on the canvas. Then click the *Item Properties* tab and customize the settings for the selected element.
- The *Command history* tab (hidden by default) displays a history of all changes applied to the print composer layout. With a mouse click it is possible to undo and redo layout steps back and forth to a certain status.

- The *Atlas generation* tab allows to enable the generation of an atlas for the current composer and gives access to its parameters.

You can add multiple elements to the composer. It is also possible to have more than one map view or legend or scalebar in the print composer canvas, on one or several pages. Each element has its own properties and in the case of the map, its own extent. If you want to remove any elements from the composer canvas you can do that with the `Delete` or the `Backspace` key.

Navigation tools

To navigate in the canvas layout, the print composer provides 4 general tools:

- Zoom in
- Zoom out
- Zoom to full extend
- Refresh the view (if you find the view in an inconsistent state)

18.1.3 Composition tab — General composition setup

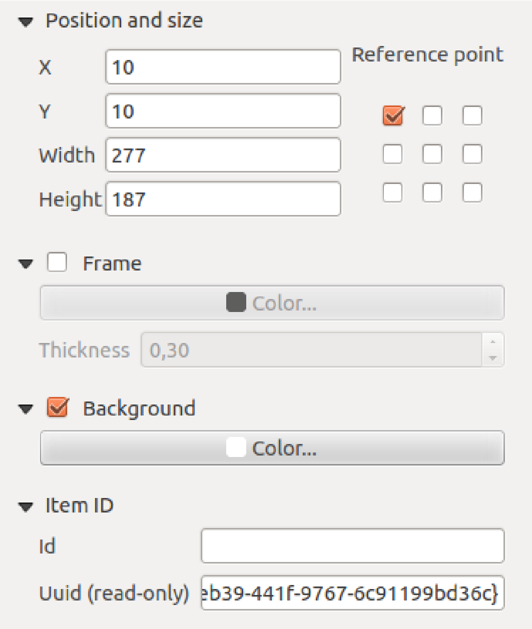
In the *Composition* tab, you can define the global settings of your composition.

- You can choose one of the *Presets* for your papersheet, or enter your custom *width* and *height*.
- Composition can now be parted on several pages. For instance, a first page can show a map canvas and a second page will show the attribute table associated to a layer while a third ons shows a HTML frame linking to your organization website. Set the *Number of pages* to the desired value.
- Choose the page *Orientation* and its *Exported resolution*
- When checked, the ☑ *print as raster* means all elements will be rasterized before printing or saving as Postscript or PDF.
- *Snap to grid* and *Snap to alignements* tools make accomplishing some tasks much easier. There's three types of grid: **Dots**, **Solid** lines and **Crosses**. You can adjust *spacings*, *offsets* and *color* to your need.
- *Selection tolerance* defines the maximum distance below which an item is snapped to the grid.
- *Snap to alignements* shows helping lines when the borders or axis of two items are aligned.

18.1.4 Composer items general options

Composer items have a set of common properties you will find on the bottom of the *Item Properties* tab: Position and size, Frame, Background, Item ID and Rendering (See figure_composer_2)

- The *Position and size* dialog lets you define size and position of the frame that contains the item. You can also choose which *Reference point* will be set at the **X** and **Y** coordinates previously defined.
- The ☑ *Frame* shows or hides the frame around the label. Click on the **[Color]** and **[Thickness]** buttons to adjust those properties.
- the ☑ *Background* enables or disables a background color. Click on the **[Color...]** button to display a dialog where you pick a color ou choose frome a custom setting. Transparency can also be adjusted throught the **alpha** field.
- Use the *Item ID* to create a relationship to other print composer items.
- *Rendering* mode can be selected in the option field. See Rendering_Mode .


Position and size
X: 10
Y: 10
Width: 277
Height: 187
Reference point:
☑ ☐ ☐
☐ ☐ ☐
☐ ☐ ☐

☐ Frame

Thickness: 0,30

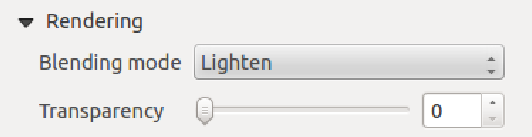
☑ Background

Item ID
Id:
Uuid (read-only): b39-441f-9767-6c91199bd36c}

Gambar 18.2: Common Item properties Dialogs

18.2 Rendering mode

QGIS now allows advanced rendering for composer items just like vector and raster layers.


Rendering
Blending mode: Lighten
Transparency: 0

Gambar 18.3: Rendering mode

- *Transparency*: you can make the underlying item in the composer visible with this tool. Use the slider to adapt the visibility of your item to your needs. You can also make a precise definition of the percentage of visibility in the the menu beside the slider.
- *Blending mode*: you can achieve special rendering effects with these tools that you previously only know from graphics programs. The pixels of your overlaying and underlaying items are mixed through the settings described below.
  - Normal: This is the standard blend mode which uses the alpha channel of the top pixel to blend with the Pixel beneath it; the colors aren't mixed
  - Lighten: It selects the maximum of each component from the foreground and background pixels. Be aware that the results tend to be jagged and harsh.
  - Screen: Light pixels from the source are painted over the destination, while dark pixels are not. This mode is most useful for mixing the texture of one layer with another layer. E.g. you can use a hillshade to texture another layer
  - Dodge: Dodge will brighten and saturate underlying pixels based on the lightness of the top pixel. So brighter top pixels cause the saturation and brightness of the underlying pixels to increase. This works best if the top pixels aren't too bright, otherwise the effect is too extreme.
  - Addition: This blend mode simply adds pixel values of one layer with the other. In case of values above 1 (in the case of RGB), white is displayed. This mode is suitable for highlighting features.

- Darken: Creates a resultant pixel that retains the smallest components of the foreground and background pixels. Like lighten, the results tend to be jagged and harsh
- Multiply: It multiplies the numbers for each pixel of the top layer with the corresponding pixel for the bottom layer. The results are darker pictures.
- Burn: Darker colors in the top layer causes the underlying layers to darken. Can be used to tweak and colorise underlying layers.
- Overlay: Combines multiply and screen blending modes. In the resulting picture light parts of the picture become lighter and dark parts become darker.
- Soft light: Very similar to overlay, but instead of using multiply/screen it uses color burn/dodge. This one is supposed to emulate shining a soft light onto an image.
- Hard light: Hard light is very similar to the overlay mode. It's supposed to emulate projecting a very intense light onto an image.
- Difference: Difference subtracts the top pixel from the bottom pixel or the other way round, to always get a positive value. Blending with black produces no change, as values for all colors are 0.
- Subtract: This blend mode simply subtracts pixel values of one layer with the other. In case of negative values, black is displayed.

18.3 Composer Items

18.3.1 Adding a current QGIS map canvas to the Print Composer

Click on the Add new map toolbar button in the print composer toolbar to add the QGIS map canvas. Now drag a rectangle on the composer canvas with the left mouse button to add the map. To display the current map, you can choose between three different modes in the map *Item Properties* tab:

- **Rectangle** is the default setting. It only displays an empty box with a message 'Map will be printed here'.
- **Cache** renders the map in the current screen resolution. If case you zoom in or out the composer window, the map is not rendered again but the image will be scaled.
- **Render** means, that if you zoom in or out the composer window, the map will be rendered again, but for space reasons, only up to a maximum resolution.

Cache is default preview mode for newly added print composer maps.

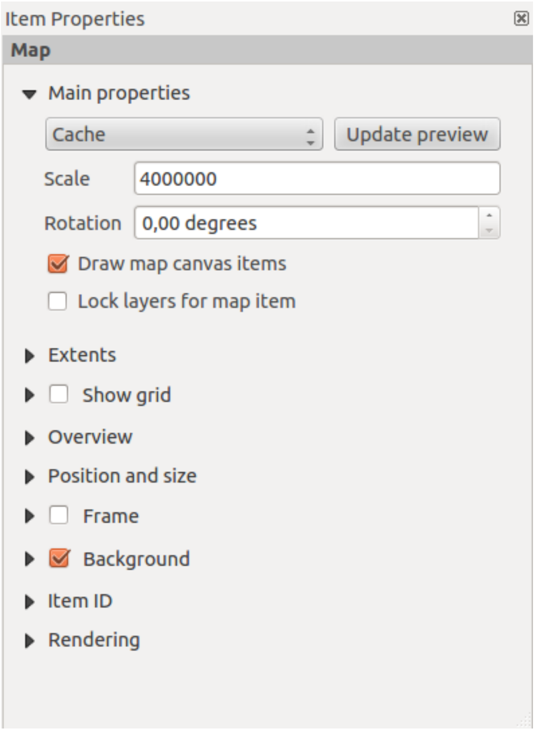
You can resize the map element by clicking on the Select/Move item button, selecting the element, and dragging one of the blue handles in the corner of the map. With the map selected, you can now adapt more properties in the map *Item Properties* tab.

To move layers within the map element select the map element, click the Move item content icon and move the layers within the map element frame with the left mouse button. After you found the right place for an element, you can lock the element position within the print composer canvas. Select the map element and click on the right mouse button to Lock the element position and again to unlock the element. You can lock the map element also activating the ☑ *Lock layers for map item* checkbox in the *Map* dialog of the *Item Properties* tab.

Main properties

The *Main properties* dialog of the map *Item Properies* tab provides following functionalities (see figure_composer_4):

- The **Preview** area allows to define the preview modes 'Rectangle', 'Cache' and 'Render', as described above. If you change the view on the QGIS map canvas by zooming or panning or changing vector or raster


Item Properties
Map
Main properties
Cache
Update preview
Extents
Show grid
Overview
Position and size
Frame
Background
Item ID
Rendering

Scale 4000000

Rotation 0,00 degrees

☑ Draw map canvas items

☐ Lock layers for map item

☐ Show grid

☐ Frame

☑ Background

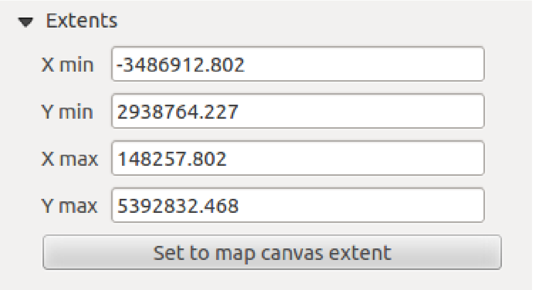
Gambar 18.4: Map Item properties Tab

properties, you can update the print composer view selecting the map element in the print composer and clicking the **[Update preview]** button.

- The field *Scale* 1,00 ⇕ sets a manual scale.
- The field *Rotation* 1,00 ⇕ allows to rotate the map element content clockwise in degrees. Note, a coordinate frame can only be added with the default value 0.
- The ☑ *Draw map canvas items* lets you show annotations that may be placed on the map canvas in the main QGIS window.
- You can choose to lock the layers shown on a map item. Check the ☑ *Lock layers for map item*. Any layer that would be displayed or hidden in the main QGIS window after checked on won't appear or be hidden in the map item of the composer. But style and labels of a locked layer is still refreshed accordingly to the main QGIS interface.

Extents

The *Extents* dialog of the map item tab provides following functionalities (see Figure figure_composer_5):


Extents
Set to map canvas extent

X min -3486912.802

Y min 2938764.227

X max 148257.802

Y max 5392832.468

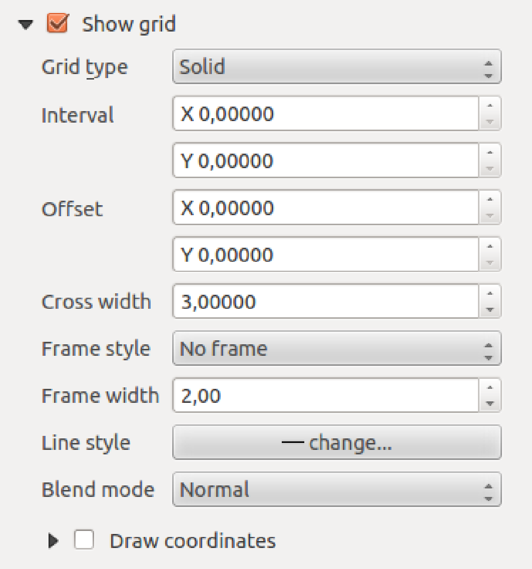
Gambar 18.5: Map Extents Dialog

- The **Map extent** area allow to specify the map extent using Y and X min/max values or clicking the **[Set to map canvas extent]** button.

If you change the view on the QGIS map canvas by zooming or panning or changing vector or raster properties, you can update the print composer view selecting the map element in the print composer and clicking the **[Update preview]** button in the map *Item Properties* tab (see Figure figure_composer_2).

Grid

The *Grid* dialog of the map *Item Properties* tab provides following functionalities (see Figure_composer_6):


☑ Show grid
Grid type: Solid
Interval: X 0,00000
Y 0,00000
Offset: X 0,00000
Y 0,00000
Cross width: 3,00000
Frame style: No frame
Frame width: 2,00
Line style: — change...
Blend mode: Normal
☐ Draw coordinates

Gambar 18.6: Map Grid Dialog

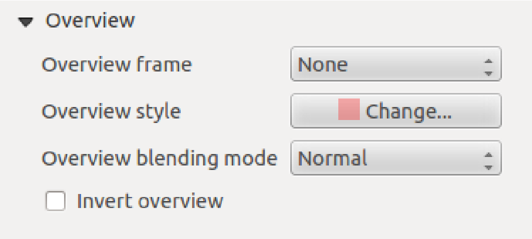
- The ☑ *Show grid* checkbox allows to overlay a grid to the map element. As grid type you can specify to use solid line or cross. Symbology of the grid can be chosen. See Section Rendering_Mode. Furthermore you can define an interval in X and Y direction, an X and Y offset, and the width used for cross or line grid type.
- You can choose to paint the frame with a Zebra style. If not selected, general frame option is used (See Section Frame_dialog) Advanced rendering mode is also available for grids. See Section Rendering_mode)
- The ☑ *Draw coordinates* checkbox allows to add coordinates to the map frame. The annotation can be drawn inside or outside the map frame. The annotation direction can be defined as horizontal, vertical, horizontal and vertical, or boundary direction, for each border individually. Units can be in meters or in degrees. Finally you can define the grid color, the annotation font, the annotation distance from the map frame and the precision of the drawn coordinates.

Overview

The *Overview* dialog of the map *Item Properties* tab provides following functionalities (see Figure_composer_7):

If the composer has more than one map, you can choose to use a map to show the extents of a second map. The *Overview* dialog of the map *Item Properties* tab allows to customize the appearance of that feature.

- The *Overview frame* combolist references the map item whose extents will be drawn on the present map item.
- The *Overview Style* allows to change the frame color. See Section vector_style_manager .



Overview frame: None

Overview style: Change...

Overview blending mode: Normal

☐ Invert overview

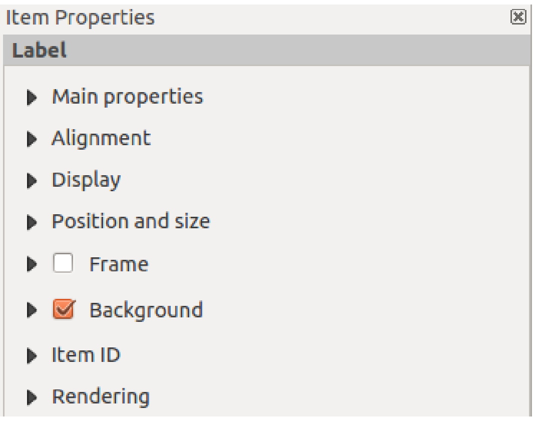
Gambar 18.7: Map Overview Dialog

- The *Overview Blend mode* allows different transparency blend modes, to enhance visibility of the frame. See Rendering_Mode
- If checked, the ☑ *Invert overview* creates a mask around the extents : the referenced map extents are shown clearly whereas everything else is blended with the frame color.

18.3.2 Adding a Label item to the Print Composer

To add a label, click the Add label icon, place the element with the left mouse button on the print composer canvas and position and customize its appearance in the label *Item Properties* tab.

The *Item Properties* tab of a Label item provides following functionalities:

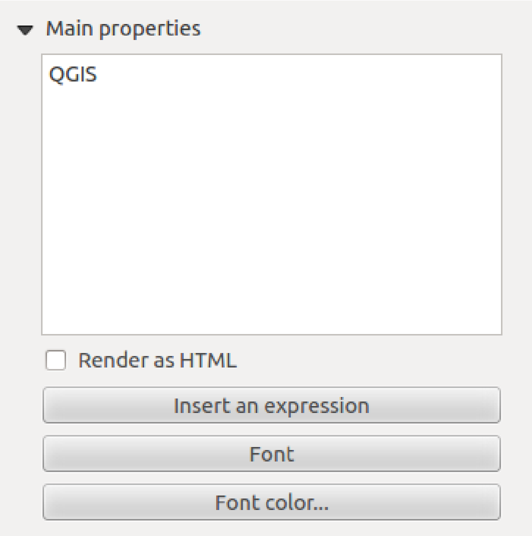


Gambar 18.8: Label Item properties Tab

Main properties

The *Main properties* dialog of the Label *Item Properties* tab provides following functionalities (see Figure_composer_9):

- The Main properties dialog is where is inserted the text (html or not) or the expression needed to fill the label added to the composer canvas.
- Labels can be interpreted as html code: check the ☑ *Render as HTML*. You can now insert a url, an clickable image that link to a web page or something more complex.
- You can also insert an expression. Click on the **[Insert an expression]** to open a new dialog. Build an expression by clicking the functions available in the left side of the panel. On the right side of the *Insert an expression dialog* is displayed the help file associated with the function selected. Two special categories can be useful, particularly associted with the Atlas functionnality : geometry functions and records functions. On the bottom side, a preview of the expression is shown.

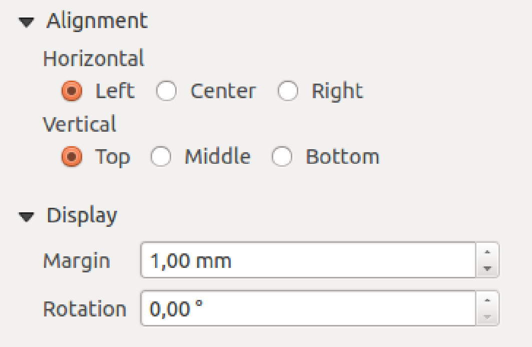

Main properties
QGIS
☐ Render as HTML
Insert an expression
Font
Font color...

Gambar 18.9: Label Main properties Dialog

- Define font and font color by clicking on the **[Font]** and **[Font color...]** buttons

Alignment and Display

The *Alignment* and *Display* dialogs of the Label *Item Properties* tab provide following functionalities (see Figure_composer_10):


Alignment
Horizontal
● Left ○ Center ○ Right
Vertical
● Top ○ Middle ○ Bottom
Display

Margin: 1,00 mm

Rotation: 0,00 °

Gambar 18.10: Label Alignment and Display Dialogs

- You can define the horizontal and vertical alignment in the *Alignment* zone
- In the **Display** tag, you can define a margin in mm and/or a rotation angle in degrees for the text.

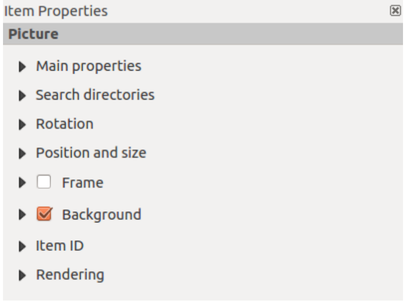
18.3.3 Adding an Image item to the Print Composer

To add an image, click the Add image icon, place the element with the left mouse button on the print composer canvas and position and customize its appearance in the image *Item Properties* tab.

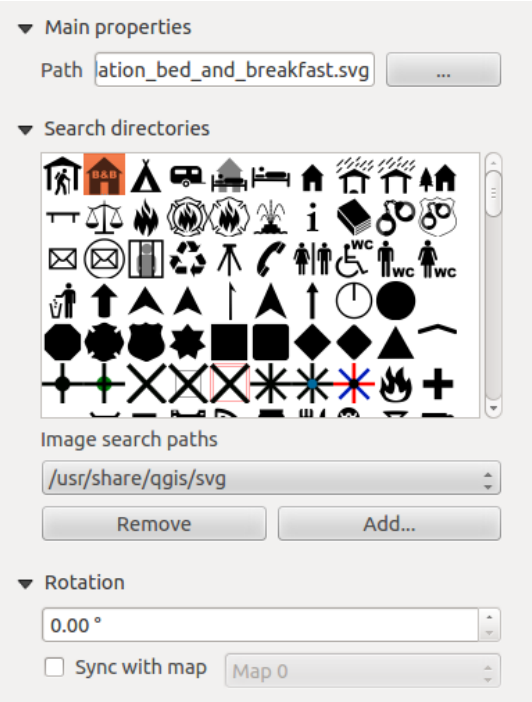
The image *Item Properties* tab provides following functionalities (see figure_composer_11):

Main properties, Search directories and Rotation

The *Main properties* and *Search directories* dialogs of the Image *Item Properties* tab provide following functionalities (see Figure_composer_12):


Item Properties
Picture
Main properties
Search directories
Rotation
Position and size
☐ Frame
☑ Background
Item ID
Rendering

Gambar 18.11: Image Item properties Tab


Main properties
...
Search directories
Remove
Add...
Rotation

Path: ation_bed_and_breakfast.svg

Image search paths: /usr/share/qgis/svg

Rotation: 0.00 °

☐ Sync with map: Map 0

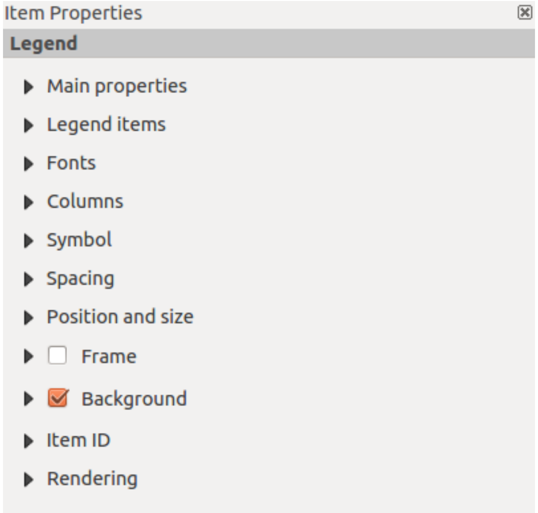
Gambar 18.12: Image Main properties, Search directories and Rotation Dialogs

- The **Main properties** dialog shows the current image that is displayed in the image item. Click on the **[...]** button to select a file on your computer.
- This dialog shows all pictures stored in the selected directories.
- The **Search directories** area allows to add and remove directories with images in SVG format to the picture database.
- Image can be rotate, with the *Rotation* 1,00 field.
- Activating the ☑ *Sync with map* checkbox synchronizes the rotation of a picture in the QGIS map canvas (i.e. a rotated north arrow) with the appropriate print composer image.

18.3.4 Adding a Legend item to the Print Composer

To add a map legend, click the Add new legend icon, place the element with the left mouse button on the print composer canvas and position and customize their appearance in the legend *Item Properties* tab.

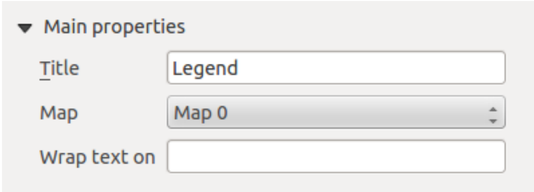
The *Item properties* of a legend item tab provides following functionalities (see figure_composer_14):


Item Properties
Legend
Main properties
Legend items
Fonts
Columns
Symbol
Spacing
Position and size
☐ Frame
☑ Background
Item ID
Rendering

Gambar 18.13: Legend Item properties Tab

Main properties

The *Main properties* dialog of the legend *Item Properties* tab provides following functionalities (see figure_composer_14):


Main properties

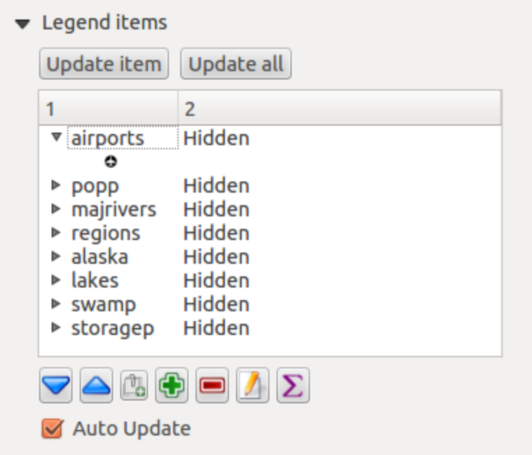
Title: Legend
Map: Map 0
Wrap text on:

Gambar 18.14: Legend Main properties Dialog

- Here you can adapt the legend title.
- Choose which *Map* item the current legend will refer to in the select list.
- Since QGIS 1.8, you can wrap the text of the legend title to a given character.

Legend items

The *Legend items* dialog of the legend *Item Properties* tab provides following functionalities (see figure_composer_15):



1	2
airports	Hidden
popp	Hidden
majrivers	Hidden
regions	Hidden
alaska	Hidden
lakes	Hidden
swamp	Hidden
storagep	Hidden

Gambar 18.15: Legend Legend Items Dialog

- The legend items window lists all legend items and allows to change item order, group layers, remove and restore items of the list, edit layer names. After changing the symbology in the QGIS main window you can click on **[Update]** to adapt the changes in the legend element of the print composer. The item order can be changed using the **[Up]** and **[Down]** buttons or with 'drag and drop' functionality.
- The feature count for each vector layer can be shown by enable the **[Sigma]** button.
- Legend can be updated automatically, ☑ *Auto-update* is checked.

Fonts, Columns, Symbol and Spacing

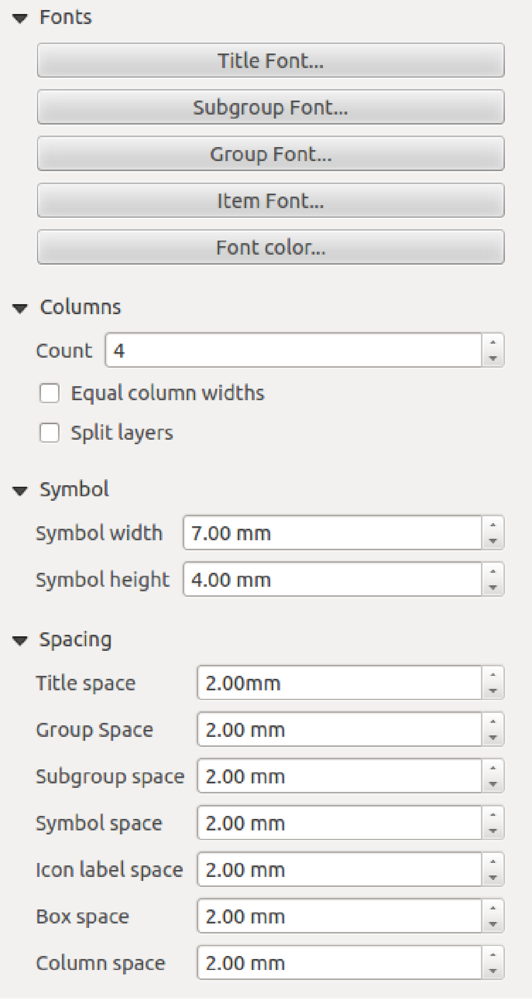
The *Fonts*, *Columns*, *Symbol* and *Spacing* dialogs of the legend *Item Properties* tab provide following functionalities (see figure_composer_16):

- You can change the font of the legend title, group, subgroup and item (layer) in the legend item. Click on a category button to open a **Select font** dialog.
- All those items will get the same **Color**
- Legend items can be arranged in several columns. Select the correct value in the *Count* 1,00 field.
- The ☑ *Equal columns widths* sets how legend columns should be adjusted.
- The ☑ *Split layers* option allows a categorized or a graduated layer legend to be divided upon columns.
- You can change width and height of the legend symbol in this dialog.
- Spacing aroung title, group, subgroup, symbol, icon label, box space or column space can be customized throught that dialog.

18.3.5 Adding a Scalebar item to the Print Composer

To add a scalebar, click the Add new scalebar icon, place the element with the left mouse button on the print composer canvas and position and customize their appearance in the scalebar *Item Properties* tab.

The *Item properties* of a scalebar item tab provides following functionalities (see figure_composer_17):



Fonts

Title Font...

Subgroup Font...

Group Font...

Item Font...

Font color...

Columns

Count 4

☐ Equal column widths

☐ Split layers

Symbol

Symbol width 7.00 mm

Symbol height 4.00 mm

Spacing

Title space 2.00mm

Group Space 2.00 mm

Subgroup space 2.00 mm

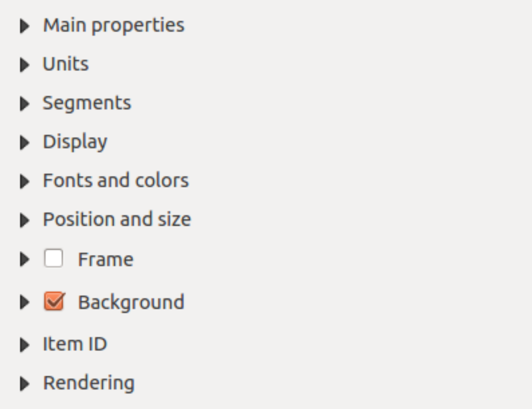
Symbol space 2.00 mm

Icon label space 2.00 mm

Box space 2.00 mm

Column space 2.00 mm

Gambar 18.16: Legend Fonts, Columns, Symbol and Spacing Dialogs



Main properties

Units

Segments

Display

Fonts and colors

Position and size

☐ Frame

☑ Background

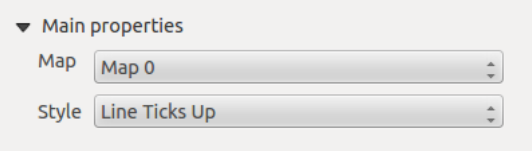
Item ID

Rendering

Gambar 18.17: Scalebar Item properties Tab

Main properties

The *Main properties* dialog of the scalebar *Item Properties* tab provides following functionalities (see figure_composer_18):



Main properties

Map: Map 0

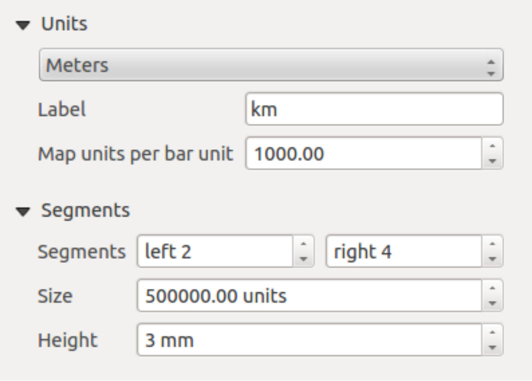
Style: Line Ticks Up

Gambar 18.18: Scalebar Main properties Dialog

- First choose the map the scalebar will be attached to.
- then choose the style of your scalebar. Six styles are available :
- **Single box** and **Double box** styles which contain one or two lines of boxes alternating colors,
- **Middle**, **Up** or **Down** line ticks,
- **Numeric** : the scale ratio is printed, i.e. 1:50000.

Units and Segments

The *Units* and *Segments* dialogs of the scalebar *Item Properties* tab provide following functionalities (see figure_composer_19):



Units

Meters

Label: km

Map units per bar unit: 1000.00

Segments

Segments: left 2 right 4

Size: 500000.00 units

Height: 3 mm

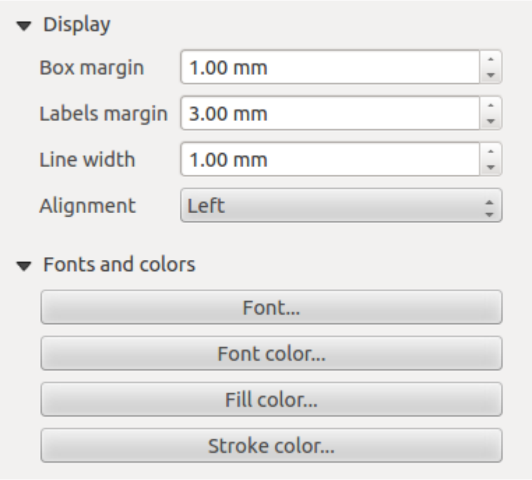
Gambar 18.19: Scalebar Units and Segments Dialogs

In those two dialogs, you can set how the scalebar will be represented.

- Select the map units used. There's three possible choices : **Map Units** is the automated unit selection, **Meters** or **Feet** force unit conversions.
- The *Label* field defines the text used to describe the unit of the scalebar.
- The *Map units per bar unit* allows to fix the ratio between a map unit and its representation in the scalebar.
- You can define how many *Segments* will be drawn on the left and on the right side of the scalebar, and how long will be each segment (*Size* field). *Height* can also be defined.

Display, Fonts and colors

The *Display* and *Fonts and colors* dialogs of the scalebar *Item Properties* tab provide following functionalities (see figure_composer_20):


Display
Fonts and colors
Font...
Font color...
Fill color...
Stroke color...

Box margin 1.00 mm
Labels margin 3.00 mm
Line width 1.00 mm
Alignment Left

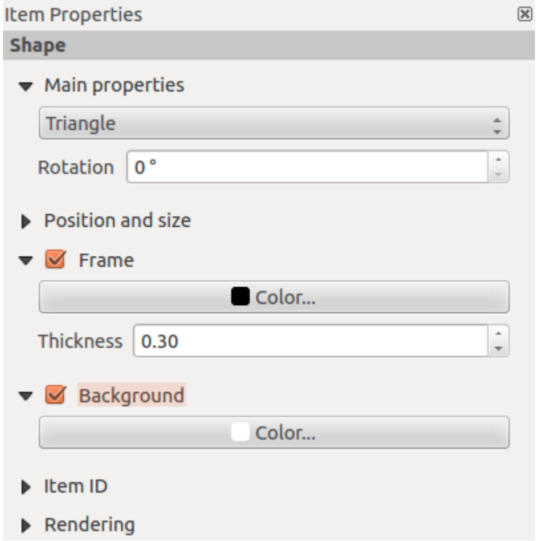
Gambar 18.20: Scalebar Display, Fonts and colors Dialogs

- You can define how the scalebar will be displayed in its frame. Adjust the *Box margin* between text and frame borders, *Labels margin* between text and scalebar drawing and the *Line width* of the scalebar drawing.
- The *Alignment* in the *Display* dialog only applies to *Numeric* styled scalebars and puts text on the left, middle or right side of the frame.

18.3.6 Adding a Basic shape or Arrow item to the Print Composer

It is possible to add basic shapes (Ellipse, Rectangle, Triangle) and arrows to the print composer canvas : click the Add basic shape icon or the Add Arrow icon, place the element with the left mouse button on the print composer canvas and position and customize their appearance in the *Item Properties* tab.

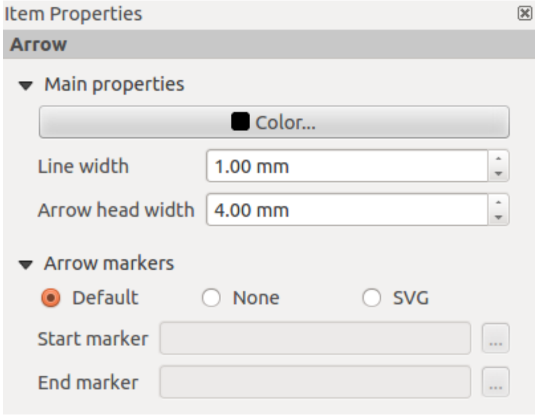
The *Shape* Item properties tab allows to draw an ellipse, rectangle, or triangle in the print composer canvas. You can define its outline and fill color, the outline width and a clockwise rotation.


Item Properties
Shape
Main properties
Position and size
Frame
Color...
Background
Color...
Item ID
Rendering

Triangle
Rotation 0 °
☑ Frame
Thickness 0.30
☑ Background

Gambar 18.21: Shape Item properties Tab

The *Arrow* Item properties tab allows to draw an arrow in the print composer canvas. You can define color, outline and arrow width and it is possible to use a default marker and no marker and a SVG marker. For the SVG marker you can additionally add a SVG start and end marker from a directory on your computer.


Item Properties
Arrow
Main properties
Color...
Arrow markers
Start marker
End marker
...

Line width 1.00 mm

Arrow head width 4.00 mm

● Default ○ None ○ SVG

Gambar 18.22: Arrow Item properties Tab

Main properties

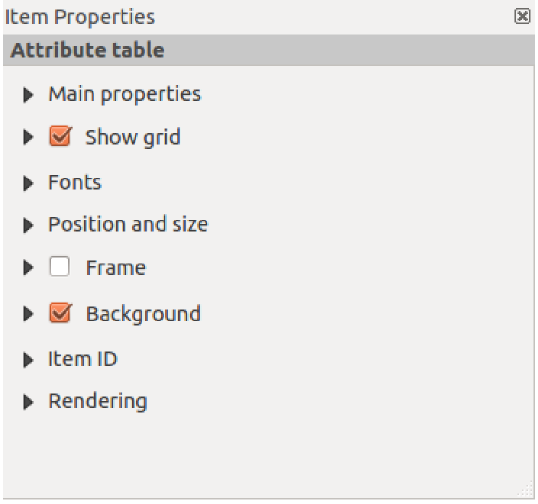
- For Basic shapes, this dialog allows you to choose a **Ellipse**, **Rectangle** or **Triangle** shape and its rotation.
- Unlike the other items, line style, line color and background color of a basic shape are adjusted with the Frame and Background dialog. No frame is drawn.
- For arrows, you can define here the line style : *Color*, *Line width* and *Arrow head width*.
- *Arrows markers* can be adjusted. If you want to set a SVG *Start marker* and/or *End marker*, browse to your SVG file by clicking on the **[...]** button after selecting *SVG* radio button.

Catatan: Unlike other items, background color for a basic shape is the shape background and not the frame one.

18.3.7 Add attribute table values to the Print Composer

It is possible to add parts of a vector attribute table to the print composer canvas : click the Add attribute table icon, place the element with the left mouse button on the print composer canvas and position and customize their appearance in the *Item Properties* tab.

The *Item properties* of a attribute table item tab provides following functionalities (see figure_composer_23):


Item Properties
Attribute table
Main properties
Fonts
Position and size
Item ID
Rendering

☑ Show grid

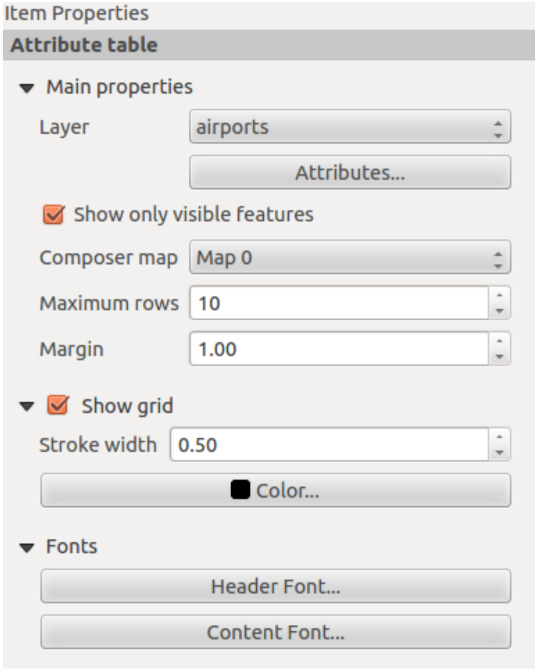
☐ Frame

☑ Background

Gambar 18.23: Scalebar Item properties Tab

Main properties, Show grid and Fonts

The *Main properties*, *Show grid* and *Fonts* dialogs of the attribute table *Item Properties* tab provide following functionalities (see figure_composer_24):


Item Properties

Attribute table

▾ Main properties

Layer: airports

Attributes...

☑ Show only visible features

Composer map: Map 0

Maximum rows: 10

Margin: 1.00

▾ ☑ Show grid

Stroke width: 0.50

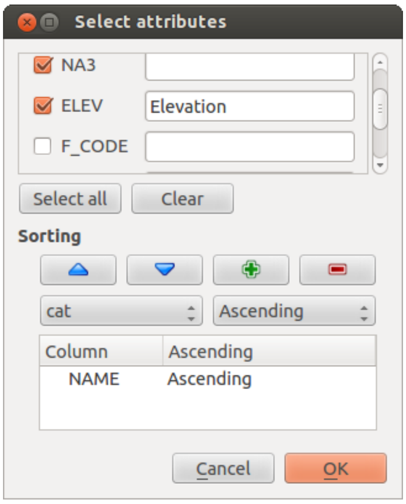
Color...

▾ Fonts

Header Font...

Content Font...

Gambar 18.24: Attribute table Main properties, Show grid and Fonts Dialog


Select attributes

☑ NA3

☑ ELEV: Elevation

☐ F_CODE

Select all | Clear

Sorting

cat | Ascending

Column	Ascending
NAME	Ascending

Cancel | OK

Gambar 18.25: Attribute table Select attributes Dialog

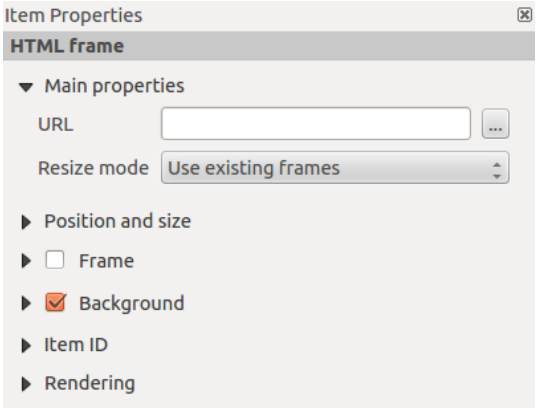
- The *Table* dialog allows to select the vector layer and columns of the attribute table. Attribute columns can be sorted and you can define to show its values ascending or descending (see figure_composer_25).
- You can choose to display only the attribute of features visibled on a map. Check ☑ *Show only visible features* and select the corresponding *Composer map* to filter.
- You can define the *Maximum number of rows* to be displayed and *margin* around text.
- Additionally you can define the grid characteristics of the table (*Stroke width* and *Color* of the grid) and the header and content font.

18.3.8 Add a HTML frame to the Print Composer

It is possible to add a clickable frame, linked to an URL : click the Add html frame icon, place the element with the left mouse button on the print composer canvas and position and customize their appearance in the *Item Properties* tab.

Main properties

The *Main properties* dialog of the HTML frame *Item Properties* tab provides following functionalities (see figure_composer_26):


Item Properties

HTML frame

Main properties

URL

Resize mode: Use existing frames

Position and size

☐ Frame

☑ Background

Item ID

Rendering

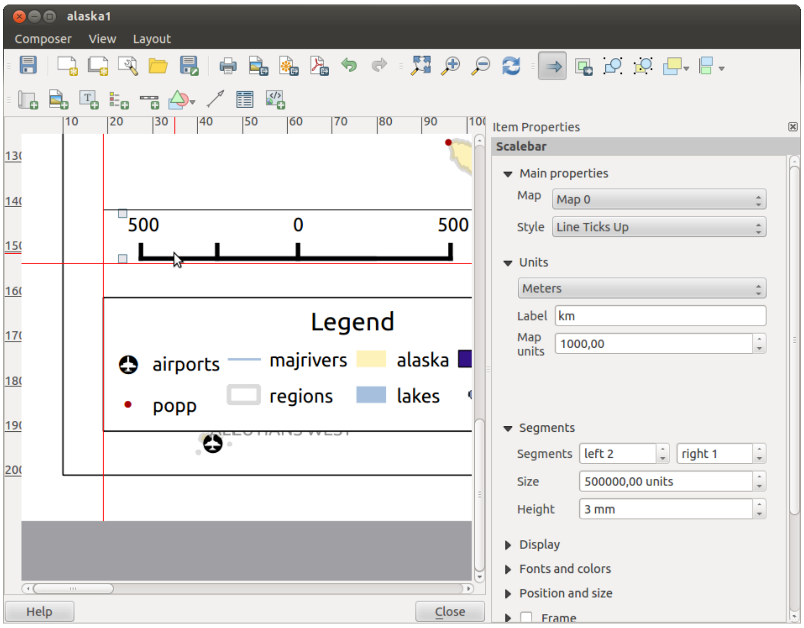
Gambar 18.26: HTML frame Item properties Tab

- Point the *URL* field to the URL or the HTML file you want to insert in the composer.
- You can adjust the rendering of that page with the *Resize mode*.
- **Use existing frames** constraints the page inside its first frame or in the frame created with the next settings.
- **Extent to next page** will create as many frames (and their pages) as necessary to render the height of the webpage. Each frame can be moved around on the layout. If you resize a frame, the webpage will be divided up upon the other frames. The last frame will be trimmed to fit the webpage.
- **Repeat on every page** will first repeat the upper left of the webpage on every page, in same sized frames.
- **Repeat until finished** will also create as many frames as the **Extend to next page** option, except All frames will have the same size.

18.4 Item alignment

Raise or lower functionalities for elements are inside the Raise selected items pulldown menu. Choose an element on the print composer canvas and select the matching functionality to raise or lower the selected element compared to the other elements (see table_composer_1).

There are several alignment functionalities available within the Align selected items pulldown menu (see table_composer_1). To use an alignment functionality , you first select some elements and then click on the matching alignment icon. All selected will then be aligned within to their common bounding box. When moving items on the composer canvas, alignment helper lines appear when borders, centers or corners are aligned.


alaska1
Composer
View
Layout
Item Properties
Scalebar
Main properties
Units
Segments
Display
Fonts and colors
Position and size
Frame
Help
Close
500
0
500
Legend
airports
majrivers
alaska
popp
regions
lakes

Map: Map 0
Style: Line Ticks Up
Meters
Label: km
Map units: 1000,00
Segments: left 2, right 1
Size: 500000,00 units
Height: 3 mm

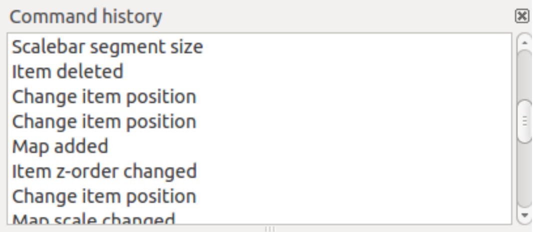
Gambar 18.27: Alignment helper lines in the Print Composer

18.4.1 Revert and Restore tools

During the layout process it is possible to revert and restore changes. This can be done with the revert and restore tools:

- Revert last changes
- Restore last changes

or by mouse click within the *Command history* tab (see figure_composer_28).


Command history

Scalebar segment size
Item deleted
Change item position
Change item position
Map added
Item z-order changed
Change item position
Map scale changed

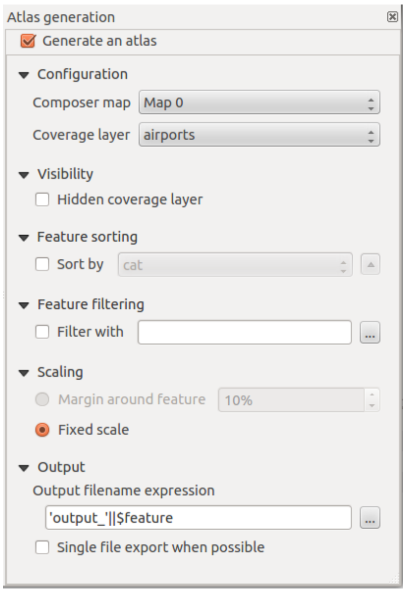
Gambar 18.28: Command history in the Print Composer

18.5 Atlas generation

The print composer includes generation functions that allow to create map books in an automated way. The concept is to use a coverage layer, which contains geometries and fields. For each geometry in the coverage layer, a new output will be generated where the content of some canvas maps will be moved to highlight the current geometry. Fields associated to this geometry can be used within text labels.

There can only be one atlas map by print composer but this one can contain multiple pages. Every pages will be generated with each feature. To enable the generation of an atlas and access generation parameters, refer to the *Atlas generation* tab. This tab contains the following widgets (see Figure_composer_29):

- A ☑ *Generate an atlas* enables or disables the atlas generation.



Atlas generation

☑ Generate an atlas

▼ Configuration

Composer map: Map 0

Coverage layer: airports

▼ Visibility

☐ Hidden coverage layer

▼ Feature sorting

☐ Sort by: cat

▼ Feature filtering

☐ Filter with

▼ Scaling

○ Margin around feature: 10%

● Fixed scale

▼ Output

Output filename expression

'output_'||$feature

☐ Single file export when possible

Gambar 18.29: Atlas generation tab

- A combobox *Composer map* ▼ that allows to choose which map item will be used as the atlas map, i.e. on which map geometries from the coverage layer will be iterated over and displayed.
- A combobox *Coverage layer* ▼ that allows to choose the (vector) layer containing the geometries on which to iterate over.
- An optional ☑ *Hidden coverage layer*, that if checked, will hide the coverage layer (but not the other ones) during the generation.
- An optional ☑ *Features sorting* that, if checked, allows to sort features of the coverage layer. The associated combobox allows to choose which column will be used as the sorting key. Sort order (either ascending or descending) is set by a two-state button that displays an up or a down arrow.
- An optional *Feature filtering* text area that allows to specify an expression for filtering features from the coverage layer. If the expression is not empty, only features that evaluate to `True` will be selected. The button on the right allows to display the expression builder.
- An input box *Scaling* that allows to select the amount of space added around each geometry within the allocated map. Its value is meaningful only when using the autoscaling mode.
- A ☑ *Fixed scale* that allows to toggle between auto-scale and fixed-scale mode. In fixed scale mode, the map will only be translated for each geometry to be centered. In auto-scale mode, the map's extents are computed in such a way that each geometry will appear in its whole.
- An *Output filename expression* textbox that is used to generate a filename for each geometry if needed. It is based on expressions. This field is meaningful only for rendering to multiple files.
- A ☑ *Single file export when possible* that allows to force the generation of a single file if this is possible by the chosen output format (PDF for instance). If this field is checked, the value of the *Output filename expression* field is meaningless.

In order to adapt labels to the feature the atlas plugin iterates over, use a label with this special notation *[%expression using field_name%]*. For example, with a city layer with fields CITY_NAME and ZIPCODE, you could insert this :

“*[% ‘The area of ‘ || upper(CITY_NAME) || ‘,’ || ZIPCODE || ‘ is ‘ format_number($area/1000000,2) || ‘ km2’ %]*“

And that would result in the generated atlas as

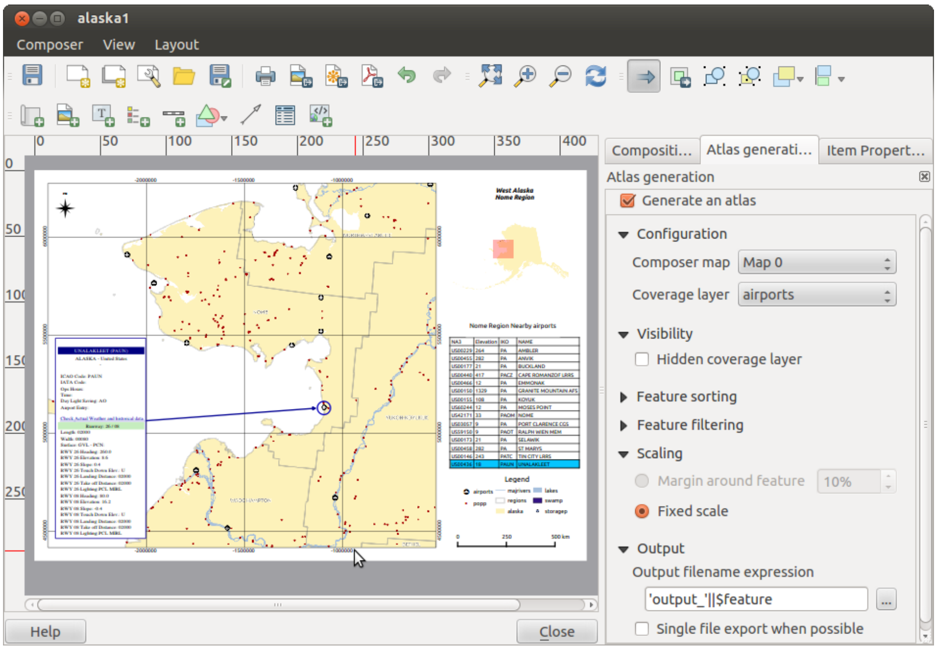
“*The area of PARIS,75001 is 1.94 km2*”.

18.5.1 Generation

The atlas generation is done when the user asks for a print or an export. The behaviour of these functions will be slightly changed if an atlas map has been selected. For instance, when the user asks for an export to PDF, if an atlas map is defined, the user will be asked for a directory where to save all the generated PDF files (except if the ☑ *Single file export when possible* has been selected).

18.6 Creating Output

Figure_composer_30 shows the print composer with an example print layout including each type of map element described in the sections above.



☑ Generate an atlas

Composer map: Map 0

Coverage layer: airports

☐ Hidden coverage layer

○ Margin around feature 10%

● Fixed scale

Output filename expression: 'output_'||$feature

☐ Single file export when possible

Gambar 18.30: Print Composer with map view, legend, image, scalebar, coordinates , text and HTML frame added

The print composer allows you to create several output formats and it is possible to define the resolution (print quality) and paper size:

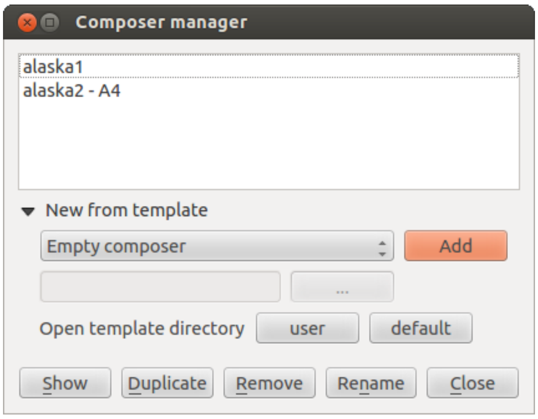
- The Print icon allows to print the layout to a connected printer or a Postscript file depending on installed printer drivers.
- The Export as image icon exports the composer canvas in several image formats such as PNG, BPM, TIF, JPG,...
- The Export as PDF saves the defined print composer canvas directly as a PDF.
- The Export as SVG icon saves the print composer canvas as a SVG (Scalable Vector Graphic).

Catatan: Currently the SVG output is very basic. This is not a QGIS problem, but a problem of the underlaying Qt library. This will hopefully be sorted out in future versions. Export big raster can sometimes fail, even if there seems to be enough memory. This is also a problem of the underlaying Qt management of raster.

18.7 Manage the Composer

With the Save as template and Load from template icons you can save the current state of a print composer session as a `.qpt` template and load the template again in another session.

The Composer Manager button in the QGIS toolbar and in *Composer* → *Composer Manager* allows to add a new composer template, create a new composition based on a previously saved template or to manage already existing templates.


Composer manager
alaska1
alaska2 - A4
New from template
Empty composer
Add
...
Open template directory
user
default
Show
Duplicate
Remove
Rename
Close

Gambar 18.31: The Print Composer Manager 🐧

By default, the composer manager searches for user templates in ~/.qgis2/composer_template.

The New Composer and Duplicate Composer buttons in the QGIS toolbar and in *Composer* → *New Composer* and *Composer* → *Duplicate Composer* allow to open a new composer dialog, or to duplicate an existing composition from a previously created one.

Finally you can save your print composition with the Save Project button. This is the same feature as in the QGIS main window. All changes will be saved in a QGIS project file.

BAB 19

Plugin

19.1 Plugin QGIS

QGIS telah dirancang dengan arsitektur plugin. Hal ini memungkinkan banyak fitur baru / fungsi dapat dengan mudah ditambahkan ke aplikasi. Banyak fitur di QGIS benar-benar diterapkan sebagai salah satu **inti** atau **plugin eksternal**.

- **Plugin Inti** dikelola oleh Tim Pengembang QGIS dan secara otomatis bagian dari setiap distribusi QGIS. Ditulis dalam salah satu dari dua bahasa: C++ atau Python. Informasi lebih lanjut tentang plugin inti disediakan dalam Bagian *Menggunakan QGIS Plugin Inti*
- **Plugin Eksternal** saat ini semua ditulis dengan Python. Mereka disimpan dalam repositori eksternal dan dipelihara oleh penulis individu. Dapat ditambahkan ke QGIS di *Get more* Bagian dari *Plugin Manager*. Informasi lebih lanjut tentang plugin eksternal disediakan dalam Bagian *Memuat Plugin eksternal QGIS*.

19.1.1 Mengelola Plugin

Mengelola plugin secara umum berarti bongkar atau muat dengan menggunakan *Plugin Manager*. Untuk menonaktifkan dan mengaktifkan plugin eksternal, *Plugin Manager* digunakan kembali.

Memuat QGIS Plugin Inti

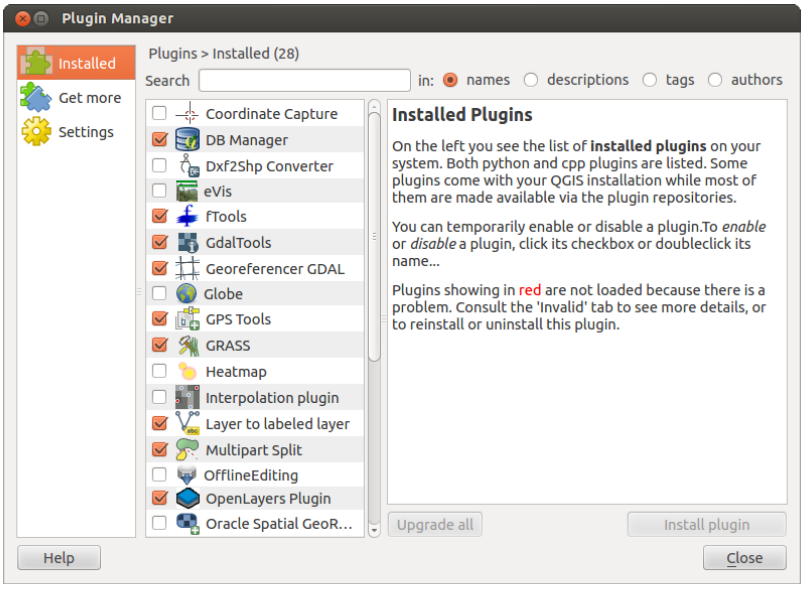
Memuat QGIS Plugin Inti dilakukan dari menu utama *Plugins* → *Manage and Install Plugins*. *Manage and Install Plugins*.

Menu *Installed* dari daftar *Plugin Manager* semua plugin yang tersedia dan status mereka (dimuat atau dibongkar), termasuk semua plugin inti dan semua plugin eksternal yang telah dipasang dan diaktifkan secara otomatis dengan menggunakan menu *Get more* (lihat Bagian *Memuat Plugin eksternal QGIS*). Plugin yang sudah dimuat memiliki tanda centang di sebelah kiri nama mereka. Figure_plugins_1 menunjukkan *Installed* dialog.

Untuk mengaktifkan plugin inti tertentu, klik kotak centang di sebelah kiri nama plugin dan klik **[OK]**. Ketika Anda keluar dari aplikasi, daftar plugin yang dimuat tetap dipertahankan, dan plugin secara otomatis dimuat.

Memuat Plugin eksternal QGIS

Plugin Eksternal QGIS ditulis dengan Python. Secara tetap disimpan baik dalam Repositori 'Resmi' QGIS, atau dalam berbagai repositori eksternal lainnya yang dikelola oleh masing-masing penulis. Anda dapat menemukan plugin eksternal dalam menu *Get more*.



- ☐ Coordinate Capture
- ☑ DB Manager
- ☐ Dxf2Shp Converter
- ☐ eVis
- ☑ fTools
- ☑ GdalTools
- ☑ Georeferencer GDAL
- ☐ Globe
- ☑ GPS Tools
- ☑ GRASS
- ☐ Heatmap
- ☐ Interpolation plugin
- ☑ Layer to labeled layer
- ☑ Multipart Split
- ☐ OfflineEditing
- ☑ OpenLayers Plugin
- ☐ Oracle Spatial GeoR...

Installed Plugins

On the left you see the list of **installed plugins** on your system. Both python and cpp plugins are listed. Some plugins come with your QGIS installation while most of them are made available via the plugin repositories.

You can temporarily enable or disable a plugin.To *enable* or *disable* a plugin, click its checkbox or doubleclick its name...

Plugins showing in red are not loaded because there is a problem. Consult the 'Invalid' tab to see more details, or to reinstall or uninstall this plugin.

Gambar 19.1: Pengelola Plugin

In the *Installed* menu you can see the path if it is an external plugin. External plugins are only installed in your home directory while core plugins are stored in `/usr` .

Dokumentasi rinci tentang penggunaan, minimum versi QGIS, homepage, penulis, dan informasi penting lainnya yang disediakan untuk Repositori 'Resmi' QGIS di http://plugins.qgis.org/plugins/. Untuk repositori eksternal lainnya, mungkin tersedia dengan plugin eksternal sendiri. Secara umum tidak termasuk dalam panduan ini.

Saat ini ada lebih dari 150 plugin eksternal yang tersedia di Repositori 'Resmi' QGIS. Beberapa plugin ini menawarkan fungsi yang akan dibutuhkan oleh banyak pengguna (contoh: menyediakan pengguna dengan kemampuan untuk melihat dan mengedit data OpenStreetMap, atau untuk menambahkan lapisan GoogleMap) sementara yang lain menawarkan fungsi yang sangat khusus (contoh: menghitung diameter pipa untuk jaringan pasokan air).

Hal ini, bagaimanapun, cukup mudah untuk mencari semua plugin eksternal yang tersedia dengan menggunakan kata kunci, memilih nama repositori dan/atau menyaring pada status plugin (saat ini terpasang atau dihapus dalam sistem Anda). Pencarian dan penyaringan dilakukan dari Pemasang Plugin Python QGIS

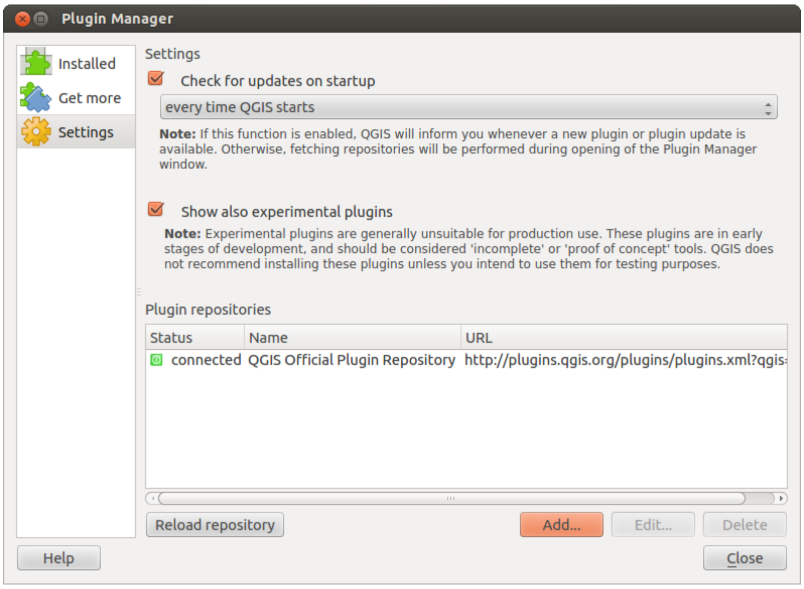
Tip: Tambah repositori

Untuk menambah repositori penulis eksternal, buka Pemasang Plugin *Manage and Install Plugins*, ke menu *Settings*, dan klik **[Tambah]** (lihat figure_plugins_2). Jika Anda tidak ingin salah satu atau lebih dari repositori ditambahkan, dapat dinonaktifkan melalui tombol **[Sunting...]**, atau benar-benar dihapus dengan tombol **[Hapus]**.

Dengan demikian, kita tidak bisa bertanggung jawab untuk mereka. Anda juga dapat mengelola daftar repositori secara manual, yaitu menambah, menghapus, dan mengedit data.

Tip: Periksa Pembaruan

Anda tetap dapat informasi tentang plugin. Aktifkan kotak centang ☑ *Check for updates on startup* dari menu *Settings*. QGIS akan memberitahu Anda setiap kali sebuah plugin atau pembaruan plugin tersedia.


Plugin Manager
Installed
Get more
Settings
Help
Reload repository
Add...
Edit...
Delete
Close

Settings

☑ Check for updates on startup

every time QGIS starts

Note: If this function is enabled, QGIS will inform you whenever a new plugin or plugin update is available. Otherwise, fetching repositories will be performed during opening of the Plugin Manager window.

☑ Show also experimental plugins

Note: Experimental plugins are generally unsuitable for production use. These plugins are in early stages of development, and should be considered 'incomplete' or 'proof of concept' tools. QGIS does not recommend installing these plugins unless you intend to use them for testing purposes.

Plugin repositories

Status	Name	URL
connected	QGIS Official Plugin Repository	http://plugins.qgis.org/plugins/plugins.xml?qgis

Gambar 19.2: Pengaturan Plugin

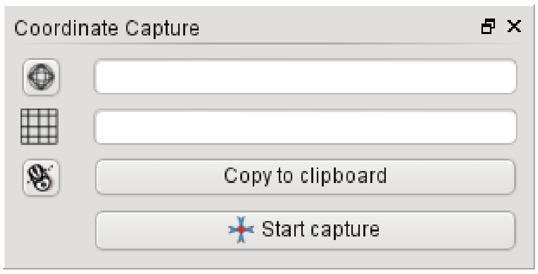
19.2 Menggunakan QGIS Plugin Inti

Ikon	Plugin	Deskripsi	Referensi Panduan
	Tangkapan Koordinat	Tetikus menangkap koordinat di CRS yang berbeda	:ref:‘coordcapt
	Pengelola DB	Mengelola basis data Anda dengan QGIS	*Plugin Pengelola DB*
	Pengubah DXF2Shape	Mengubah berkas format dari DXF ke SHP	*Plugin Pengonversi Dxf2Shp*
	eVis	Alat Visualisasi	*eVis Plugin*
	fTools	Perangkat alat vektor	*Plugin fTools*
	Perangkat GPS	Alat untuk bongkar impor data GPS	*GPS Plugin*
	GRASS	Fungsionalitas GRASS	*GRASS GIS Integration*
	Alat GDAL	Fungsionalitas raster GDAL	*Plugin Alat GDAL*
	Pemberi Georeferensi GDAL	Georeferensi Raster dengan GDAL	*Plugin Georeferencer*
	Heatmap	Membuat heatmap raster dari memasukkan titik vektos	*Heatmap Plugin*
	Plugin Interpolasi	Interpolasi pada dasar simpul dari lapisan vektor	*Plugin Interpolasi*
	Menyunting di luar jaringan	Penyuntingan di luar jaringan dan sinkronisasi dengan basis data	*Plugin Mengedit Diluar Jaringan (Offline)*
	Oracle Spasial Georaster	Akses Oracle Spasial GeoRaster	*Oracle GeoRaster Plugin*
	Pengelola Plugin	Mengelola inti dan plugin eksternal	*Mengelola Plugin*
	Analisis Raster Terrain	Fitur menghitung geomorfologi dari DEM	*Plugin Raster Analisis Terrain*
	Plugin Grafik Jalan	Analisis jalur terpendek	*Plugin Grafik Jalan*
	Plugin SQL Anywhere	Akses SQL dimanapun DB	*Plugin SQL Anywhere*
	Query Spasial	Query spasial pada vektor	*Plugin Spatial Query*
	Statistik Zonal	Hitung statistik raster untuk poligon vektor	*Plugin Statistik Zonal*

19.3 Plugin Mengambil Koordinat

Plugin Mengambil Koordinat mudah digunakan dan memberikan kemampuan menampilkan koordinat di kanvas peta untuk dua Sistem Koordinat Referensi (CRS) dipilih.

1. Mulai QGIS, pilih *Proyek Properti* dari *Pengaturan* (KDE, Windows) atau menu *Berkas* (Gnome, OSX) dan klik pada tab *Proyeksi*. Sebagai alternatif, Anda juga bisa klik pada ikon CRS status di sudut kanan bawah dari status bar.
2. Klik pada kotak centang ☑ *Aktifkan proyeksi on the fly* dan pilih proyeksi sistem koordinat dari yang Anda pilih (lihat juga *Working with Projections*).
3. Muat plugin ambil koordinat ke dalam Manajer Plugin (see *Memuat QGIS Plugin Inti*) dan memastikan



Gambar 19.3: Plugin Mengambil Koordinat

bahwa dialog terlihat dengan pergi ke *Tampilan* → *Panel* dan pastikan bahwa ☑ *Ambil Koordinat* udah aktif. Dialog ambil koordinat seperti dalam gambar figure_coordinate_capture_1. Alternatif lain, Anda juga bisa ke *Vektor* → *Ambil Koordinat* dan lihat ☑ *Ambil Koordinat* sudah aktif.

4. Klik pada ikon Klik pilih CRS untuk menampilkan koordinat dan memilih CRS berbeda dari yang Anda pilih di atas.
5. Untuk mulai mengambil koordinat, klik pada **[Mulai ambil]**. Sekarang Anda dapat mengklik di mana saja di kanvas peta dan plugin akan menampilkan koordinat untuk kedua CRS yang Anda pilih.
6. Untuk mengaktifkan tetikus pelacak koordinat, klik ikon pelacak tetikus.
7. Anda juga bisa menyalin koordinat yang dipilih ke papanklip.

19.4 Plugin Pengelola DB

Plugin Pengelola DB resmi bagian dari inti QGIS dan bermaksud untuk menggantikan Plugin SPIT dan tambahan untuk mengintegrasikan semua format basisdata lain yang didukung oleh QGIS dalam satu antarmuka pengguna. Plugin Manajer DB menyediakan beberapa fitur. Anda dapat menggeser lapisan dari Penjelajah QGIS ke Pengelola DB dan akan mengimpor lapisan Anda ke dalam basisdata spasial Anda. Anda dapat menggeser dan menempatkan tabel antar basisdata spasial dan mereka akan diimpor. Anda juga dapat menggunakan Pengelola DB untuk mengeksekusi query SQL terhadap basisdata spasial Anda dan kemudian melihat keluaran spasial untuk queries dengan menambahkan hasilnya ke QGIS sebagai lapisan query.

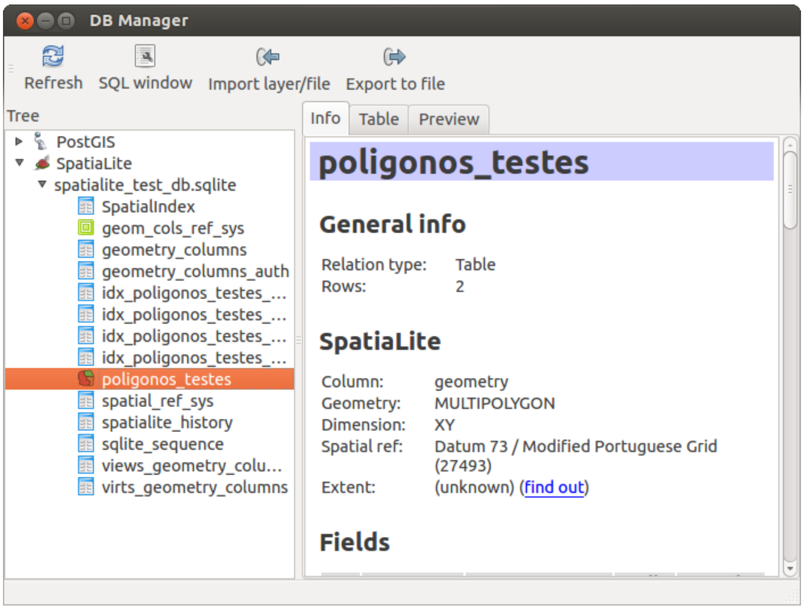
Menu *Basisdata* memungkinkan untuk terhubung ke basisdata yang sudah ada, untuk memulai SQL-Window dan untuk keluar dari Plugin Pengeloa DB. Satu Anda terhubung ke basisdata yang sudah ada, menu *Skema* dan *Tabel* tambahan muncul.

Menu *Skema* termasuk alat untuk membuat dan menghapus (kosong) skema dan, jika topologi tersedia (seperti PostGIS 2) untuk memulai *TopoViewer*.

Menu *Tabel* memungkinkan untuk membuat dan mengedit tabel dan menghapus tabel dan tampilan. Hal ini juga memungkinkan untuk mengosongkan tabel dan untuk memindahkan tabel dari skema satu ke skema lain. Seperti fungsionalitas lebih lanjut Anda dapat melakukan VACUUM dan kemudian ANALYZE untuk setiap tabel yang dipilih. VACUUM sederhana mengambil kembali ruang dan membuatnya tersedia untuk digunakan kembali dan ANALYZE update statistik untuk menentukan cara yang paling efisien untuk mengeksekusi query. Akhirnya Anda dapat mengimpor lapisan/berkas, jika mereka dimuat dalam QGIS atau ada dalam sistem berkas. Dan Anda dapat mengekspor tabel basisdata untuk Shape dengan fitur Ekspor berkas.

Jendela *Tree* daftar semua database yang ada didukung oleh QGIS. Dengan doble-klik Anda bisa koneksi ke basisdata. Dengan tombol tetikus-kanan Anda bisa mengubah nama dan menghapus skema dan tabel yang ada. Tabel juga dapat ditambahkan ke kanvas QGIS dengan menu konteks.

Jika terkoneksi ke sebuah basisdata, jendela **utama** dari Pengelola DB menyediakan tiga tab. Tab *Info* memberikan informasi tentang tabel dan geometri serta tentang kolom yang ada, Kendala dan Indeks. Hal ini juga memungkinkan untuk menjalankan Vacuum Analis dan untuk membuat indeks spasial pada tabel yang dipilih,


DB Manager
Refresh
SQL window
Import layer/file
Export to file
Tree
PostGIS
SpatiaLite
spatialite_test_db.sqlite
SpatialIndex
geom_cols_ref_sys
geometry_columns
geometry_columns_auth
idx_poligonos_testes_...
idx_poligonos_testes_...
idx_poligonos_testes_...
idx_poligonos_testes_...
poligonos_testes
spatial_ref_sys
spatialite_history
sqlite_sequence
views_geometry_colu...
virts_geometry_columns
Info
Table
Preview

poligonos_testes

General info

Relation type: Table
Rows: 2

SpatiaLite

Column: geometry
Geometry: MULTIPOLYGON
Dimension: XY
Spatial ref: Datum 73 / Modified Portuguese Grid (27493)
Extent: (unknown) (find out)

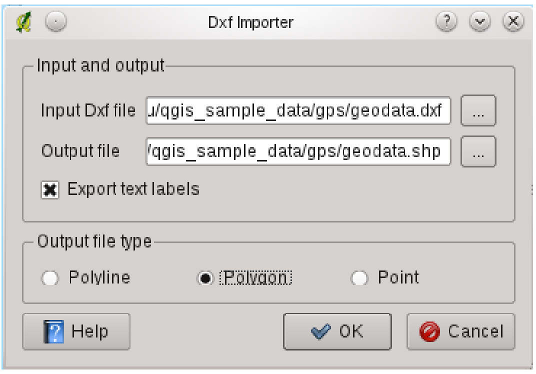
Fields

Gambar 19.4: Dialog Pengelola DB

jika belum melakukannya. Tab *Tabel* menampilkan semua atribut dan tab *Pratinjau* render geometri sebagai pratinjau..

19.5 Plugin Pengonversi Dxf2Shp

Plugin pengonversi dxf2shape dapat digunakan untuk mengkonversi data vektor dari DXF ke format Shapefile. Hal ini membutuhkan parameter berikut harus ditentukan sebelum menjalankan:


Dxf Importer
Input and output
Output file type
Help
OK
Cancel

Input Dxf file: u/qgis_sample_data/gps/geodata.dxf
Output file: /qgis_sample_data/gps/geodata.shp
☒ Export text labels
○ Polyline ● Polygon ○ Point

Gambar 19.5: Plugin Pengonversi Dxf2Shp

- **Masukan berkas DXF**: Masukkan path ke berkas DXF yang akan dikonversi
- **Keluaran berkas SHP**: Masukkan nama yang diinginkan dari Shapefile yang akan dibuat
- **Keluaran tipe berkas**: Tentukan jenis geometri keluaran Shapefile. Saat ini jenis yang didukung adalah polyline, polygon, dan titik.
- **Ekspor label teks**: Ketika kotak centang ini diaktifkan, lapisan titik Shapefile tambahan akan dibuat, dan tabel dbf terkait akan berisi informasi tentang kolom "TEXT" yang ditemukan dalam berkas DXF, dan teks string mereka sendiri.

19.5.1 Menggunakan Plugin

1. Mulai QGIS, muat plugin Dxf2Shape di Manajer Plugin (lihat Bagian *Memuat QGIS Plugin Inti*) dan klik pada ikon Pengonversi Dxf2Shape yang muncul di menu toolbar QGIS. Dialog plugin Dxf2Shape akan muncul seperti Figure_dxf2shape_1.
2. Masukkan berkas DXF, nama untuk keluaran Shapefile dan jenis Shapefile.
3. Aktifkan kotak centang ☑ *Ekspor teks label* jika Anda ingin membuat lapisan titi ekstra dengan label.
4. Klik **[OK]**.

19.6 eVis Plugin

The Biodiversity Informatics Facility at the American Museum of Natural History's (AMNH) Center for Biodiversity and Conservation (CBC) (this section is derived from Horning, N., K. Koy, P. Ersts. 2009. eVis (v1.1.0) User's Guide. American Museum of Natural History, Center for Biodiversity and Conservation. Available from http://biodiversityinformatics.amnh.org/, and released under the GNU FDL.) has developed the Event Visualization Tool (eVis), another software tool to add to the suite of conservation monitoring and decision support tools for guiding protected area and landscape planning. This plugin enables users to easily link geocoded (i.e., referenced with latitude and longitude or X and Y coordinates) photographs, and other supporting documents, to vector data in QGIS.

eVis is now automatically installed and enabled in new versions of QGIS, and as with all plugins, it can be disabled and enabled using the Plugin Manager (See *Mengelola Plugin*).

The eVis plugin is made up of three modules: the 'Database Connection tool', 'Event ID tool', and the 'Event Browser'. These work together to allow viewing of geocoded photographs and other documents that are linked to features stored in vector files, databases, or spreadsheets.

19.6.1 Event Browser

The Event Browser module provides the functionality to display geocoded photographs that are linked to vector features displayed in the QGIS map window. Point data, for example, can be from a vector file that can be input using QGIS or it can be from the result of a database query. The vector feature must have attribute information associated with it to describe the location and name of the file containing the photograph and, optionally, the compass direction the camera was pointed when the image was acquired. Your vector layer must be loaded into QGIS before running the Event Browser.

Launch the Event Browser module

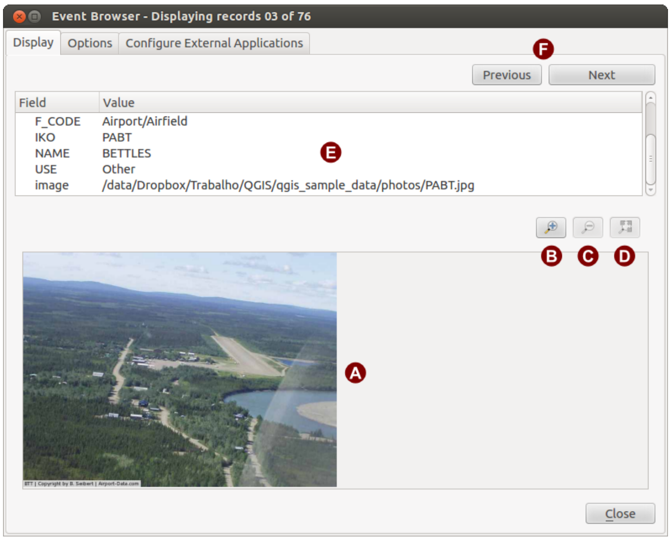
To launch the Event browser module either click on the eVis Event Browser icon or click on *Database* → *eVis* → *eVis Event Browser*. This will open the *Generic Event Browser* window.

The *Event Browser* window has three tabs displayed at the top of the window. The *Display* tab is used to view the photograph and its associated attribute data. The *Options* tab provides a number of settings that can be adjusted to control the behavior of the eVis plugin. Lastly, the *Configure External Applications* tab is used to maintain a table of file extensions and their associated application to allow eVis to display documents other than images.

Understanding the Display window

To see the *Display* window click on the *Display* tab in the *Event Browser* window. The *Display* window is used to view geocoded photographs and their associated attribute data.

1. **Display window**: A window where the photograph will appear.

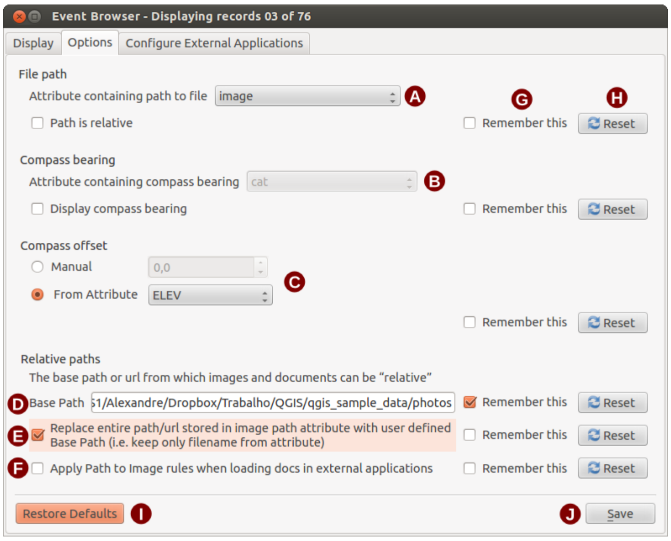

Event Browser - Displaying records 03 of 76
Display
Options
Configure External Applications
F
Previous
Next
E
B
C
D
A
Close

Field	Value
F_CODE	Airport/Airfield
IKO	PABT
NAME	BETTLES
USE	Other
image	/data/Dropbox/Trabalho/QGIS/qgis_sample_data/photos/PABT.jpg

Gambar 19.6: The *eVis* display window

2. **Zoom in button**: Zoom in to see more detail. If the entire image cannot be displayed in the display window, scroll bars will appear on the left and bottom sides of the window to allow you to pan around the image.
3. **Zoom out button**: Zoom out to see more area.
4. **Zoom to full extent** button: Displays the full extent of the photograph.
5. **Attribute information window**: All of the attribute information for the point associated with the photograph being viewed is displayed here. If the file type being referenced in the displayed record is not an image but is of a file type defined in the *Configure External Applications* tab then when you double-click on the value of the field containing the path to the file the application to open the file will be launched to view or hear the contents of the file. If the file extension is recognized the attribute data will be displayed in green.
6. **Navigation buttons**: Use the Previous and Next buttons to load the previous or next feature when more than one feature is selected.

Understanding the Options window


Event Browser - Displaying records 03 of 76
Display
Options
Configure External Applications
A
G
H
B
C
D
E
F
Restore Defaults
I
J
Save

File path
Attribute containing path to file: image
☐ Path is relative ☐ Remember this Reset

Compass bearing
Attribute containing compass bearing: cat
☐ Display compass bearing ☐ Remember this Reset

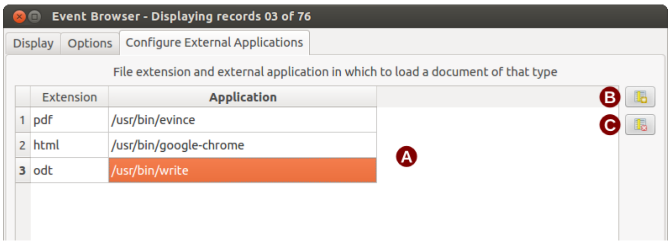
Compass offset
○ Manual 0,0
● From Attribute ELEV
☐ Remember this Reset

Relative paths
The base path or url from which images and documents can be "relative"
Base Path: ;1/Alexandre/Dropbox/Trabalho/QGIS/qgis_sample_data/photos ☑ Remember this Reset
☑ Replace entire path/url stored in image path attribute with user defined Base Path (i.e. keep only filename from attribute) ☐ Remember this Reset
☐ Apply Path to Image rules when loading docs in external applications ☐ Remember this Reset

Gambar 19.7: The *eVis* Options window

1. **File path**: A dropdown list to specify the attribute field that contains the directory path or URL for the photographs or other documents being displayed. If the location is a relative path then the checkbox must be clicked. The base path for a relative path can be entered in the *Base Path* text box below. Information about the different options for specifying the file location are noted in the section *Specifying the location and name of a photograph* below.
2. **Compass bearing**: A dropdown list to specify the attribute field that contains the compass bearing associated with the photograph being displayed. If compass bearing information is available it is necessary to click the checkbox below the dropdown menu title.
3. **Compass offset**: Compass offsets can be used to compensate for declination (adjust bearings collected using magnetic bearings to true north bearings). Click the ● *Manual* radiobutton to enter the offset in the text box or click the ● *From Attribute* radiobutton to select the attribute field containing the offsets. For both of these options east declinations should be entered using positive values and west declinations should use negative values.
4. **Directory base path**: The base path onto which the relative path defined in Figure_eVis_2 (A) will be appended.
5. **Replace path**: If this checkbox is checked, only the file name from the A will be appended to the Base Path.
6. **Apply rule to all documents**: If checked, the same path rules that are defined for photographs will be used for non-image documents such as movies, text documents, and sound files. If not checked the path rules will only apply to photographs and other documents will ignore the Base Path parameter.
7. **Remember settings**: If the checkbox is checked the values for the associated parameters will be saved for the next session when the window is closed or when the **[Save]** button below is pressed.
8. **Reset values**: Resets the values on this line to the default setting.
9. **Restore defaults**: This will reset all of the fields to their default settings. It has the same effect as clicking all of the **[Reset]** buttons.
10. **Save**: This will save the settings without closing the *Options* pane.

Understanding the Configure External Applications window


Event Browser - Displaying records 03 of 76
Display
Options
Configure External Applications
B
C
A

File extension and external application in which to load a document of that type

	Extension	Application
1	pdf	/usr/bin/evince
2	html	/usr/bin/google-chrome
3	odt	/usr/bin/write

Gambar 19.8: The *eVis* External Applications window

1. **File reference table**: A table containing file types that can be opened using eVis. Each file type needs a file extension and the path to an application that can open that type of file. This provides the capability of opening a broad range of files such as movies, sound recordings, and text documents instead of only images.
2. **Add new file type**: Add a new file type with a unique extension and the path for the application that can open the file.
3. **Delete current row**: Delete the file type highlighted in the table and defined by a file extension and a path to an associated application.

19.6.2 Specifying the location and name of a photograph

The location and name of the photograph can be stored using an absolute or relative path or a URL if the photograph is available on a web server. Examples of the different approaches are listed in Table evis_examples.

```
X         Y         FILE                                              BEARING
780596    1784017   C:\Workshop\eVis_Data\groundphotos\DSC_0168.JPG   275
780596    1784017   /groundphotos/DSC_0169.JPG                        80
780819    1784015   http://biodiversityinformatics.amnh.org/\
                    evis_testdata/DSC_0170.JPG                        10
780596    1784017   pdf:http://www.testsite.com/attachments.php?\
                    attachment_id-12                                  76
```

19.6.3 Specifying the location and name of other supporting documents

Supporting documents such as text documents, videos, and sound clips can also be displayed or played by eVis. To do this it is necessary to add an entry in the file reference table that can be accessed from the *Configure External Applications* window in the *Generic Event Browser* that matches the file extension to an application that can be used to open the file. It is also necessary to have the path or URL to the file in the attribute table for the vector layer. One additional rule that can be used for URLs that don't contain a file extension for the document you want to open is to specify the file extension before the URL. The format is — `file extension:URL`. The URL is preceded by the file extension and a colon, and is particularly useful for accessing documents from Wikis and other web sites that use a database to manage the web pages (see Table evis_examples).

19.6.4 Using the Event Browser

When the *Event Browser* window opens a photograph will appear in the display window if the document referenced in the vector file attribute table is an image and if the file location information in the *Options* window is properly set. If a photograph is expected and it does not appear it will be necessary to adjust the parameters in the *Options* window.

If a supporting document (or an image that does not have a file extension recognized by eVis) is referenced in the attribute table the field containing the file path will be highlighted in green in the attribute information window if that file extension is defined in the file reference table located in the *Configure External Applications* window. To open the document double-click on the green-highlighted line in the attribute information window. If a supporting document is referenced in the attribute information window and the file path is not highlighted in green then it will be necessary to add an entry for the file's filename extension in the *Configure External Applications* window. If the file path is highlighted in green but does not open when double-clicked it will be necessary to adjust the parameters in the *Options* window so the file can be located by eVis.

If no compass bearing is provided in the *Options* window a red asterisk will be displayed on top of the vector feature that is associated with the photograph being displayed. If a compass bearing is provided then an arrow will appear pointing in the direction indicated by the value in the compass bearing display field in the *Event Browser* window. The arrow will be centered over the point that is associated with the photograph or other document.

To close the *Event Browser* window click on the **[Close]** button from the *Display* window.

19.6.5 Event ID Tool

The 'Event ID' module allows you to display a photograph by clicking on a feature displayed in the QGIS map window. The vector feature must have attribute information associated with it to describe the location and name of the file containing the photograph and optionally the compass direction the camera was pointed when the image was acquired. This layer must be loaded into QGIS before running the 'Event ID' tool.

Launch the Event ID module

To launch the 'Event ID' module either click on the Event ID icon or click on *Database* → *eVis* → *Event ID Tool*. This will cause the cursor to change to an arrow with an 'i' on top of it signifying that the ID tool is active.

To view the photographs linked to vector features in the active vector layer displayed in the QGIS map window, move the Event ID cursor over the feature and then click the mouse. After clicking on the feature, the *Event Browser* window is opened and the photographs on or near the clicked locality are available for display in the browser. If more than one photograph is available, you can cycle through the different features using the **[Previous]** and **[Next]** buttons. The other controls are described in the ref:*evis_browser* section of this guide.

19.6.6 Database connection

The 'Database Connection' module provides tools to connect to and query a database or other ODBC resource, such as a spreadsheet.

eVis can directly connect to four types of databases:PostgreSQL, MySQL, SQLite, and can also read from ODBC connections (e.g.MS Access). When reading from an ODBC database (such as an Excel spreadsheet) it is necessary to configure your ODBC driver for the operating system you are using.

Launch the Database Connection module

To launch the 'Database Connection' module either click on the appropriate icon eVis Database Connection or click on *Database* → *eVis* → *Database Connection*. This will launch the *Database Connection* window. The window has three tabs: *Predefined Queries*, *Database Connection*, and *SQL Query*. The *Output Console* window at the bottom of the window displays the status of actions initiated by the different sections of this module.

Connect to a database

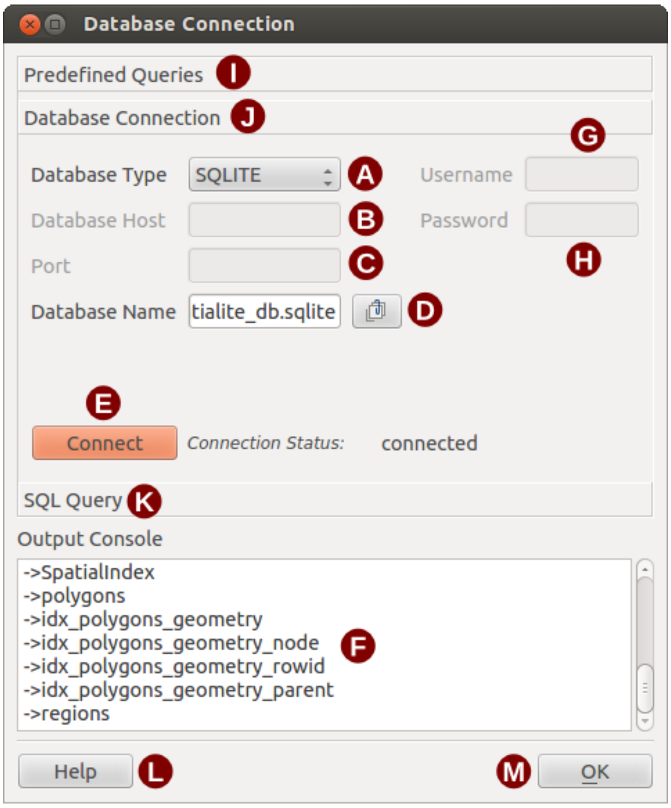
Click on the *Database Connection* tab to open the database connection interface. Next, use the *Database Type* combobox to select the type of database that you want to connect to. If a password or username is required, that information can be entered in the *Username* and *Password* textboxes.

Enter the database host in the *Database Host* textbox. This option is not available if you selected 'MS Access' as the database type. If the database resides on your desktop you should enter "localhost".

Enter the name of the database in the *Database Name* textbox. If you selected 'ODBC' as the database type, you need to enter the data source name.

When all of the parameters are filled in, click on the **[Connect]** button. If the connection is successful, a message will be written in the *Output Console* window stating that the connection was established. If a connection was not established you will need to check that the correct parameters were entered above.

1. **Database Type**: A dropdown list to specify the type of database that will be used.
2. **Database Host**: The name of the database host.
3. **Port** The port number if a MySQL or PostgreSQL database type is selected.
4. **Database Name** The name of the database.
5. **Connect** A button to connect to the database using the parameters defined above.
6. **Output Console** The console window where messages related to processing are displayed.
7. **Username**: Username for use when a database is password protected.
8. **Password**: Password for use when a database is password protected.
9. **Predefined Queries**: Tab to open the "Predefined Queries" window.
10. **Database Connection**: Tab to open the "Database Connection" window.
11. **SQL Query**: Tab to open the "SQL Query" window.
12. **Help**: Displays the on line help.
13. **OK**: Close the main "Database Connection" window.



Database Type: SQLITE

Database Name: tialite_db.sqlite

Connection Status: connected

```
->SpatialIndex
->polygons
->idx_polygons_geometry
->idx_polygons_geometry_node
->idx_polygons_geometry_rowid
->idx_polygons_geometry_parent
->regions
```

Gambar 19.9: The *eVis* Database connection window

Running SQL queries

SQL queries are used to extract information from a database or ODBC resource. In eVis the output from these queries is a vector layer added to the QGIS map window. Click on the *SQL Query* tab to display the SQL query interface. SQL commands can be entered in this text window. A helpful tutorial on SQL commands is available at http://www.w3schools.com/sql. For example, to extract all of the data from a worksheet in an Excel file, `select * from [sheet1$]` where `sheet1` is the name of the worksheet.

Click on the **[Run Query]** button to execute the command. If the query is successful a *Database File Selection* window will be displayed. If the query is not successful an error message will appear in the *Output Console* window.

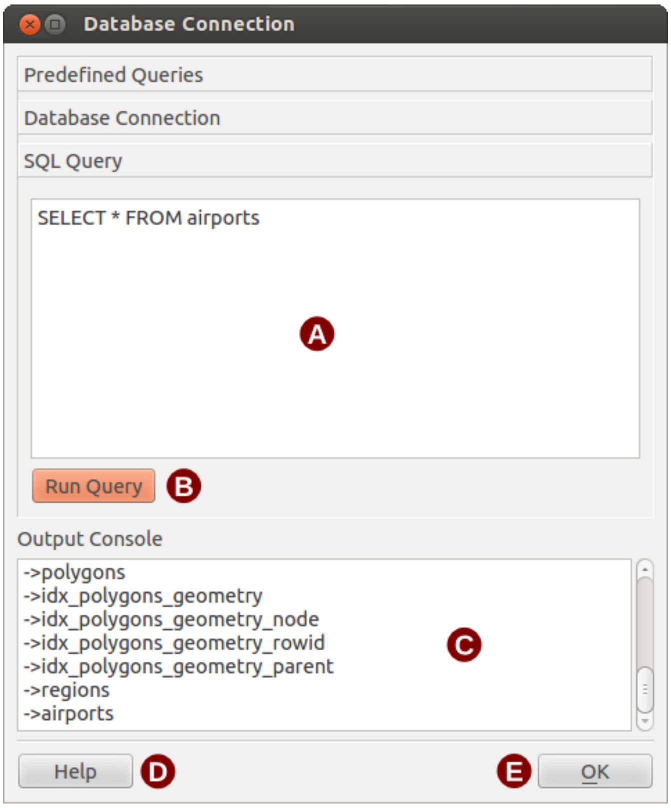
In the *Database File Selection* window, enter the name of the layer that will be created from the results of the query in the *Name of New Layer* textbox.

1. **SQL Query Text Window**: A screen to type SQL queries.
2. **Run Query**: Button to execute the query entered in the *SQL Query Window*.
3. **Console Window**: The console window where messages related to processing are displayed.
4. **Help**: Displays the on line help.
5. **OK**: Closes the main *Database Connection* window.

Use the *X Coordinate* and *Y Coordinate* comboboxes to select the field from the database that store the `X` (or longitude) and `Y` (or latitude) coordinates. Clicking on the **[OK]** button causes the vector layer created from the SQL query to be displayed in the QGIS map window.

To save this vector file for future use, you can use the QGIS 'Save as...' command that is accessed by right clicking on the layer name in the QGIS map legend and then selecting 'Save as...'

Tip: Creating a vector layer from a Microsoft Excel Worksheet



```
SELECT * FROM airports
```

```
->polygons
->idx_polygons_geometry
->idx_polygons_geometry_node
->idx_polygons_geometry_rowid
->idx_polygons_geometry_parent
->regions
->airports
```

Gambar 19.10: The eVis SQL query tab

When creating a vector layer from a Microsoft Excel Worksheet you might see that unwanted zeros (“0”) have been inserted in the attribute table rows beneath valid data.This can be caused by deleting the values for these cells in Excel using the `Backspace` key. To correct this problem you need to open the Excel file (you’ll need to close QGIS if there if you are connected to the file to allow you to edit the file) and then use *Edit* → *Delete* to remove the blank rows from the file. To avoid this problem you can simply delete several rows in the Excel Worksheet using *Edit* → *Delete* before saving the file.

Running predefined queries

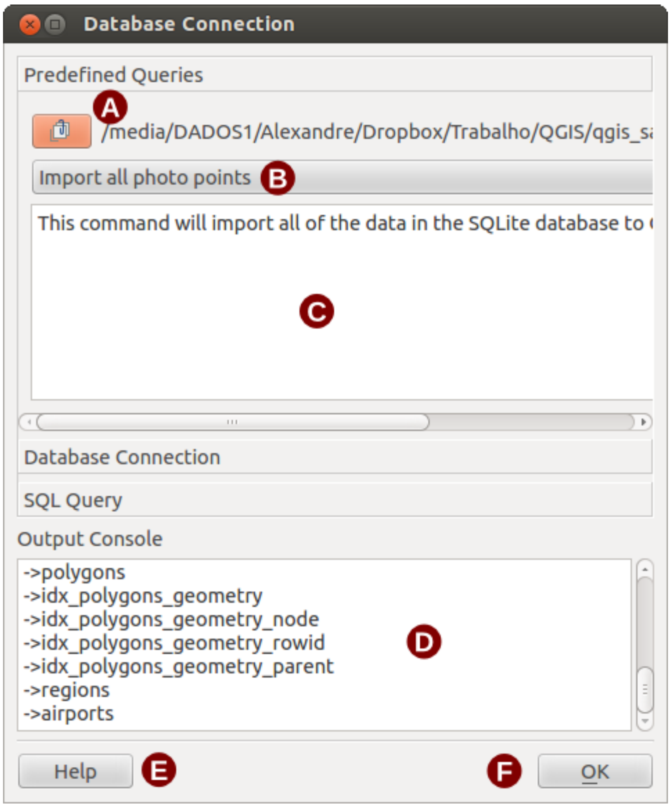
With predefined queries you can select previously written queries stored in XML format in a file. This is particularly helpful if you are not familiar with SQL commands. Click on the *Predefined Queries* tab to display the predefined query interface.

To load a set of predefined queries click on the Open File icon. This opens the *Open File* window which is used to locate the file containing the SQL queries. When the queries are loaded their titles, as defined in the XML file, will appear in the dropdown menu located just below the Open File icon, the full description of the query is displayed in the text window under the dropdown menu.

Select the query you want to run from the dropdown menu and then click on the *SQL Query* tab to see that the query has been loaded into the query window. If it is the first time you are running a predefined query or are switching databases, you need to be sure to connect to the database.

Click on the **[Run Query]** button in the *SQL Query* tab to execute the command. If the query is successful a *Database File Selection* window will be displayed. If the query is not successful an error message will appear in the *Output Console* window.

1. **Open File**: Launches the “Open File” file browser to search for the XML file holding the predefined queries.
2. **Predefined Queries**: A dropdown list with all of the queries defined by the predefined queries XML file.


Database Connection
Predefined Queries
A
B
C
D
E
F
Database Connection
SQL Query
Output Console
Help
OK

/media/DADOS1/Alexandre/Dropbox/Trabalho/QGIS/qgis_s

Import all photo points

This command will import all of the data in the SQLite database to

```
->polygons
->idx_polygons_geometry
->idx_polygons_geometry_node
->idx_polygons_geometry_rowid
->idx_polygons_geometry_parent
->regions
->airports
```

Gambar 19.11: The *eVis* Predefined queries tab

3. **Query description**: A short description of the query. This description is from the predefined queries XML file.
4. **Console Window**: The console window where messages related to processing are displayed.
5. **Help**: Displays the on line help.
6. **OK**: Closes the main “Database Connection” window.

XML format for eVis predefined queries

The XML tags read by eVis

Tag	Description
query	Defines the beginning and end of a query statement.
shortdescription	A short description of the query that appears in the eVis dropdown menu.
description	A more detailed description of the query displayed in the Predefined Query text window.
databasetype	The database type as defined in the Database Type dropdown menu in the Database Connection tab.
databaseport	The port as defined in the Port textbox in the Database Connection tab.
databasename	The database name as defined in the Database Name textbox in the Database Connection tab.
databaseusername	The database username as defined in the Username textbox in the Database Connection tab.
databasepassword	The database password as defined in the Password textbox in the Database Connection tab.
sqlstatement	The SQL command.
autoconnect	A flag ("true"" or "false") to specify if the above tags should be used to automatically connect to database without running the database connection routine in the Database Connection tab.

A complete sample XML file with three queries is displayed below:

```
<?xml version="1.0"?>
<doc>
 <query>
   <shortdescription>Import all photograph points</shortdescription>
   <description>This command will import all of the data in the SQLite database to QGIS
      </description>
   <databasetype>SQLITE</databasetype>
   <databasehost />
   <databaseport />
   <databasename>C:\textbackslash Workshop/textbackslash
eVis\_Data\textbackslash PhotoPoints.db</databasename>
   <databaseusername />
   <databasepassword />
   <sqlstatement>SELECT Attributes.*, Points.x, Points.y FROM Attributes LEFT JOIN
      Points ON Points.rec_id=Attributes.point_ID</sqlstatement>
   <autoconnect>false</autoconnect>
 </query>
  <query>
   <shortdescription>Import photograph points "looking across Valley"</shortdescription>
   <description>This command will import only points that have photographs "looking across
      a valley" to QGIS</description>
   <databasetype>SQLITE</databasetype>
   <databasehost />
   <databaseport />
   <databasename>C:\Workshop\eVis_Data\PhotoPoints.db</databasename>
   <databaseusername />
   <databasepassword />
   <sqlstatement>SELECT Attributes.*, Points.x, Points.y FROM Attributes LEFT JOIN
      Points ON Points.rec_id=Attributes.point_ID where COMMENTS='Looking across
      valley'</sqlstatement>
   <autoconnect>false</autoconnect>
 </query>
 <query>
   <shortdescription>Import photograph points that mention "limestone"</shortdescription>
   <description>This command will import only points that have photographs that mention
      "limestone" to QGIS</description>
   <databasetype>SQLITE</databasetype>
   <databasehost />
   <databaseport />
   <databasename>C:\Workshop\eVis_Data\PhotoPoints.db</databasename>
   <databaseusername />
   <databasepassword />
   <sqlstatement>SELECT Attributes.*, Points.x, Points.y FROM Attributes LEFT JOIN
      Points ON Points.rec_id=Attributes.point_ID where COMMENTS like '%limestone%'
      </sqlstatement>
   <autoconnect>false</autoconnect>
 </query>
</doc>
```

19.7 Plugin fTools

Tujuan dari plugin fTools python adalah untuk menyediakan sumber daya one-stop untuk banyak tugas GIS umum berbasis vektor, tanpa perlu perangkat lunak tambahan, perpustakaan, atau workarounds kompleks. Ini menyediakan paket pengelolaan data spasial dan fungsi analisis yang baik cepat dan fungsional.

fTools sekarang otomatis terpasang dan aktif dalam QGIS versi terbaru, dan seperti semua plugin, bisa dinonaktifkan dan diaktifkan menggunakan Pengelola Plugin (Lihat Bagian *Memuat QGIS Plugin Inti*). Ketika diaktifkan, plugin fTools menambahkan menu *Vektor* ke QGIS, menyediakan fungsi mulai dari Peralatan Analisis dan Riset ke Peralatan Geometri dan Geoprocessing, serta beberapa Peralatan Tata Kelola Data yang berguna.

19.7.1 Alat Analisis

Ikon	Alat	Kegunaan
	Jarak Matriks	Ukur jarak antara dua lapisan titik, dan hasil keluarannya a) Matriks jarak Square, b) Matriks jarak Linear, atau c) Ringkasan dari jarak. Dapat membatasi jarak ke k fitur terdekat.
	Sum panjang garis	Hitung jumlah total garis panjang untuk setiap poligon dari lapisan vektor poligon.
	Poin di poligon	Hitung jumlah poin yang terjadi pada setiap poligon dari masukan lapisan vektor poligon.
	Daftar nilai unik	Daftar semua nilai unik di dalam masukan kolom lapisan vektor
	Dasar statistik	Hitung statistik dasar (rata-rata, std dev, N, sum, CV) pada koom masukan.
	Analisis Tetangga Terdekat	Menghitung Statistik tetangga terdekat, menilai tingkat pengelompokan dalam lapisan titik vektor
	Koordinat Mean	Hitung pusat rata-rata normal atau tertimbang dari seluruh lapisan vektor, atau beberapa fitur berdasarkan kolom ID unik.
	Persimpangan garis	Cari persimpangan antara garis, dan hasil keluaran sebagai titik shapefile. Berguna untuk mencari persimpangan jalan atau sungai, mengabaikan persimpangan garis dengan panjang > 0.

Tabel Ftools 1: fTools Analysis tools

19.7.2 Peralatan Riset

Ikon	Alat	Kegunaan
	Seleksi Random	Secara acak memilih nomor n dari fitur, atau persentase n dari fitur
	Seleksi acak dalam subset	Secara acak memilih fitur dalam subset berdasarkan kolom ID unik.
	Poin Acak	Menghasilkan poin pseudo-acak atas masukan lapisan yang diberikan.
	Poin reguler	Menghasilkan kotak biasa dari poin atas wilayah tertentu dan ekspor mereka sebagai titik shapefile.
	Kotak vektor	Menghasilkan kotak garis atau poligon yang didasarkan pada pengguna jaringan jarak tertentu.
	Pilih dari lokasi	Pilih fitur berdasarkan lokasi relatif mereka terhadap lapisan lain untuk membentuk pilihan baru, atau menambah atau mengurangi dari pilihan saat ini.
	Poligon dari lapisan batas	Buat layer poligon persegi panjang tunggal dari luasnya sebuah masukan lapisan raster atau lapisan vektor.

Tabel Ftools 2: fTools Research tools

19.7.3 Peralatan Geoprocessing

Ikon	Alat	Kegunaan
	Convex hull(s)	Buat convex hull minimum untuk masukan lapisan, atau berdasarkan kolom ID.
	Penyangga	Buat penyangga sekitar fitur berdasarkan jarak, atau kolom jarak.
	Memotong	Tampilan lapisan-lapisan seperti keluaran berisi daerah di mana kedua lapisan berpotongan.
	Penggabungan	Tampilan lapisan-lapisan seperti keluaran berisi daerah berpotongan dan non-berpotongan.
	Perbedaan simetrik	Tampilan lapisan seperti keluaran berisi daerah-daerah dari masukan dan perbedaan lapisan yang tidak berpotongan.
	Klip	Tampilan lapisan seperti keluaran berisi daerah yang bersinggungan lapisan klip.
	Perbedaan	Tampilan lapisan seperti keluaran yang berisi daerah yang tidak memotong lapisan klip.
	Larut	Menggabungkan fitur berdasarkan masukan bidang. Semua fitur dengan nilai masukan yang identik digabungkan untuk membentuk satu fitur tunggal.
	Menghilangkan poligon sepotong	Menggabungkan fitur yang dipilih dengan poligon tetangga dengan daerah terbesar atau batas umum terbesar.

Tabel Ftools 3: fTools Peralatan Geoprocessing

19.7.4 Peralatan Geometri

Ikon	Alat	Kegunaan
	Periksa validitas geometri	Periksa poligon untuk persimpangan, ditutup-lubang, dan memperbaiki pengurutan node.
	Ekspor/Tambah kolom geometri	Tambah lapisan vektor geometri ke lapisan poin (XCOORD, YCOORD), garis (LENGTH), atau poligon (AREA, PERIMETER).
	Polygon centroids	Menghitung centroid berlaku untuk setiap poligon dalam masukan lapisan poligon.
	Triangulasi Delaunay	Menghitung dan keluaran (sebagai poligon) triangulasi Delaunay dari masukan lapisan vektor titik.
	Poligon Voronoi	Menghitung poligon voronoi dari masukan lapisan vektor.
	Sederhanakan geometri	Generalisasi garis atau poligon dengan algoritma Douglas-Peucker dimodifikasi.
	Geometri densify	Densify garis atau poligon dengan menambahkan simpul
	Multipart ke singgelpart	Mengkonversi fitur multipart ke beberapa fitur singgelpart. Membuat poligon dan garis sederhana.
	Singgelpart ke multipart	Merge beberapa fitur ke fitur tunggal berdasarkan kolom ID unik.
	Poligon ke garis	Mengkonversi poligon ke garis, poligon multipart untuk beberapa garis singgelpart.
	Garis ke poligon	Mengkonversi garis ke poligon, garis multi ke beberapa bagian poligon tunggal.
	Ekstrak simpul	Ekstrak simpul dari lapisan garis dan poligon dan keluaran mereka sebagai poin.

Tabel Ftools 4: fTools Peralatan Geometri

Catatan: Alat *Menyederhanakan geometri* dapat digunakan untuk menghapus simpul duplikat di garis dan poligon geometri, hanya mengatur parameter *Menyederhanakan toleransi* ke 0 dan ini akan melakukan trik.

19.7.5 Peralatan Tata Kelola Data

Ikon	Alat	Kegunaan
	Tentukan proyeksi sekarang	Tentukan CRS untuk shapefile yang CRS belum ditetapkan.
	Menggabung atribut sesuai lokasi	Menggabung dengan atribut tambahan ke lapisan vektor didasarkan pada hubungan spasial. Atribut dari satu lapisan vektor yang ditambahkan ke tabel atribut dari lapisan lain dan diekspor sebagai shapefile.
	Membagi lapisan vektor	Membagi lapisan masukan ke beberapa lapisan terpisah berdasarkan masukan kolom.
	Menggabung shapefile menjadi satu	Menggabungkan beberapa shapefile dalam folder ke dalam shapefile baru berdasarkan jenis lapisan (titik, garis, area).
	Membuat indeks spasial	Buat indeks spasial untuk yang didukung format OGR.

Tabel Ftools 5: fTools Peralatan Tata Kelola Data

19.8 Plugin Alat GDAL

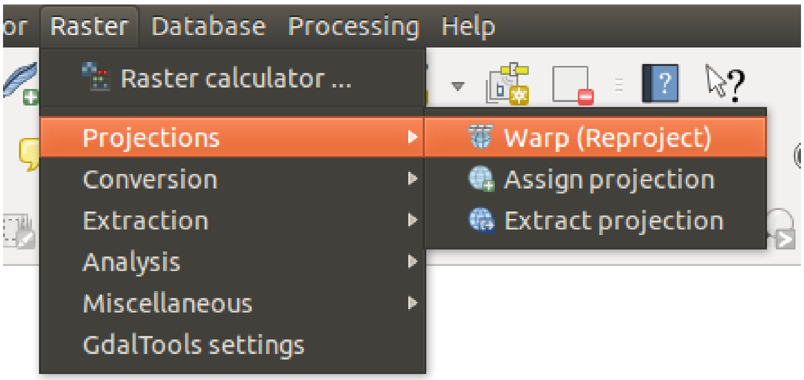
19.8.1 Apakah yang dimaksud Alat GDAL?

Plugin Alat GDAL menawarkan GUI untuk koleksi alat dalam Geospatial Data Abstraction Library, http://gdal.osgeo.org. Ini adalah alat manajemen raster untuk query, re-proyek, warp dan menggabungkan berbagai format raster. Juga termasuk adalah alat untuk membuat lapisan kontur (vektor), atau relief shaded dari DEM raster, dan untuk membuat vrt (Virtual Raster Tile dalam format XML) dari koleksi satu atau lebih berkas raster. Alat ini tersedia bila plugin terpasang dan diaktifkan.

Perpustakaan GDAL

Perpustakaan GDAL terdiri dari satu set program baris perintah, masing-masing dengan daftar besar pilihan. Pengguna nyaman dengan menjalankan perintah dari terminal dapat memilih baris perintah, dengan akses pilihan set lengkap. Plugin alat GDAL menawarkan antarmuka yang mudah ke alat-alat, memperlihatkan hanya pilihan yang paling populer.

19.8.2 Daftar dari alat-alat GDAL



Gambar 19.12: Daftar menu *Alat-alat GDAL*

Proyeksi

Warp (Reproject)	Utilitas ini merupakan mosaicing gambar, proyeksi ulang dan warping utilitas. Program ini dapat proek ulang untuk setiap proyeksi yang didukung, dan juga dapat menerapkan GCPs disimpan dengan gambar jika gambar "raw" dengan informasi kontrol. Untuk informasi lebih lanjut Anda dapat membaca di situs GDAL http://www.gdal.org/gdalwarp.html
Menetapkan proyeksi	Alat ini memungkinkan menetapkan proyeksi untuk raster yang sudah bergeoreferensi tetapi informasi proyeksi keliru. Juga dengan membantu mengubah definisi proyeksi yang ada. Kedua berkas tunggal dan mode batch didukung. Untuk informasi lebih lanjut silakan kunjungi halaman utilitas di situs GDAL http://www.gdal.org/gdalwarp.html
Ekstrak proyeksi	Utilitas ini membantu Anda untuk mengekstrak informasi proyeksi dari berkas masukan. Jika Anda ingin mengambil proyeksi dari seluruh direktori Anda dapat menggunakan mode Batch. Ini menciptakan kedua berkas `.prj` dan `.wld`.

Konversi

Rasterize	Program ini membakar vektor geometri (titik, garis dan poligon) ke pita raster dari gambar raster. Vektor dibaca dari OGR yang didukung format vektor. Perhatikan bahwa data vektor harus sama sistem koordinat dengan data raster; pada proyeksi ulang fly tidak disediakan. Untuk informasi lebih lanjut lihat http://www.gdal.org/gdal_rasterize.html
Polygonize	Utilitas ini menciptakan vektor poligon untuk semua daerah piksel terhubung di raster berbagi nilai umum pixel. Setiap poligon dibuat dengan atribut yang menunjukkan nilai pixel poligon itu. Utilitas akan menciptakan keluaran sumber data vektor jika tidak sudah ada, default ke format shapefile ESRI. Lihat juga http://www.gdal.org/gdal_polygonize.html
Terjemahan	Utilitas ini dapat digunakan untuk mengkonversi data raster antar format yang berbeda, berpotensi melakukan beberapa operasi seperti subsettings, resampling, dan rescaling piksel dalam proses. Untuk informasi Anda bisa membaca di http://www.gdal.org/gdal_translate.html
RGB ke PCT	Utilitas ini akan menghitung tabel warna-pseudo yang optimal untuk citra RGB yang diberikan dengan menggunakan algoritma cut median pada RGB histogram downsampled. Kemudian mengubah gambar menjadi gambar berwarna-pseudo menggunakan tabel warna. Konversi ini menggunakan Floyd-Steinberg dithering (difusi error) untuk memaksimalkan keluaran visual gambar kualitas. Utilitas ini juga dijelaskan pada http://www.gdal.org/rgb2pct.html
PCT ke RGB	Utilitas ini akan mengkonversi sebuah pita pseudocolor pada berkas masukan ke berkas keluaran RGB dari format yang diinginkan. Untuk informasi lebih lanjut lihat http://www.gdal.org/pct2rgb.html

Ekstraksi

Kontur	Program ini menghasilkan berkas kontur vektor dari masukan data elevasi raster (DEM). Pada http://www.gdal.org/gdal_contour.html Anda bisa menemukan banyak informasi.
Clipper	Utilitas ini memungkinkan untuk klip (ekstrak bagian) raster menggunakan batas yang dipilih atau berdasarkan masker lapisan batas. Informasi lebih lanjut dapat ditemukan di http://www.gdal.org/gdal_translate.html.

Analisis

Sieve	Utilitas ini menghilangkan raster poligon lebih kecil dari ukuran ambang batas yang disediakan (dalam piksel) dan menggantikan mereka dengan nilai piksel dari tetangga poligon terbesar. Hasilnya dapat ditulis kembali ke pita raster yang sudah ada, atau disalin ke dalam sebuah berkas baru. Untuk informasi lebih lanjut, lihat http://www.gdal.org/gdal_sieve.html .
Hampir Hitam	Utilitas ini akan memindai gambar dan mencoba untuk mengatur semua piksel yang hampir hitam (atau hampir putih) di sekitar tepi persis hitam (atau putih). Hal ini sering digunakan untuk "fix up" berkurangnya kompresi foto udara sehingga warna piksel dapat diperlakukan sebagai transparan ketika mosaicing. Lihat juga http://www.gdal.org/nearblack.html .
Isi tidak ada data	Utilitas ini mengisi seleksi raster area (biasanya tidak ada data area) dengan interpolasi dari piksel yang valid di sekitar tepi area. Lihat juga http://www.gdal.org/gdal_fillnodata.html .
Kedekatan	Utilitas ini menghasilkan peta raster kedekatan menunjukkan jarak dari pusat setiap piksel ke pusat piksel terdekat diidentifikasi sebagai piksel sasaran. Target piksel adalah pada raster sumber yang nilai raster piksel di set dari nilai target piksel. Untuk informasi lebih lanjut, lihat http://www.gdal.org/gdal_proximity.html .
Kisi (Interpolasi)	Utilitas ini menciptakan kisi biasa (raster) dari data yang tersebar dibaca dari sumber data OGR. Masukan data akan diinterpolasi untuk mengisi node kisi dengan nilai-nilai, Anda dapat memilih dari berbagai metode interpolasi. Utilitas ini juga dijelaskan di situs GDAL http://www.gdal.org/gdal_grid.html .
DEM (Terrain model)	Alat untuk menganalisis dan memvisualisasikan DEM. Hal ini dapat membuat relief shaded, lereng, aspek, warna relief, Indeks Terrain Ketidakrataan, Indeks Posisi Topografi dan kekasaran peta dari setiap GDAL didukung elevasi raster. Untuk informasi lebih lanjut Anda dapat membaca pada http://www.gdal.org/gdaldem.html .

Bermacam-macam

Build Virtual Raster (Katalog)	Program ini membangun VRT (Virtual Dataset) yang merupakan mosaik dari daftar masukan dataset gdal. Lihat juga http://www.gdal.org/gdalbuildvrt.html .
Gabung	Utilitas ini secara otomatis akan mosaik serangkaian gambar. Semua gambar harus dalam sistem koordinat yang sama dan memiliki sejumlah pencocokan pita, tetapi mereka mungkin tumpang tindih, dan pada resolusi yang berbeda. Di daerah-daerah tumpang tindih, gambar terakhir akan disalin lebih dari yang sebelumnya. Utilitas ini juga dijelaskan pada http://www.gdal.org/gdal_merge.html .
Informasi	Utilitas ini berisi berbagai informasi tentang GDAL didukung dataset raster. Lihat juga http://www.gdal.org/gdalinfo.html .
Gambaran Build	Utilitas gdaladdo dapat digunakan untuk membangun atau membangun kembali gambar ikhtisar untuk format berkas yang paling didukung dengan salah satu dari beberapa algoritma downsampling. Untuk informasi lebih lanjut, lihat http://www.gdal.org/gdaladdo.html .
Indeks Tile	Utilitas ini membangun shapefile dengan catatan untuk setiap berkas masukan raster, atribut yang berisi nama berkas, dan geometri poligon menguraikan raster. Lihat juga http://www.gdal.org/gdaltindex.html .

19.9 Plugin Georeferencer

Plugin Georeferencer adalah alat untuk menghasilkan berkas-berkas dunia untuk raster-raster. Hal ini memungkinkan Anda untuk membuat referensi raster dengan sistem koordinat geografis atau diproyeksikan dengan menciptakan GeoTiff baru atau dengan menambahkan sebuah berkas dunia dengan gambar yang ada. Pendekatan dasar Georeferensi raster adalah untuk menemukan titik-titik pada raster Anda secara akurat dan dapat menentukan koordinat mereka.

Fitur-fitur

Ikon	Tujuan	Ikon	Tujuan
	Buka raster	▶	Memulai georeferensi
	Menghasilkan Skrip GDAL		Muat Poin-Poin GCP
	Simpan Poin GCP Sebagai	⚙	Pengaturan Transformasi
	Tambah Poin		Hapus Poin
	Pindahkan Poin GCP	✋	Pan
🔍	Perbesar	🔍	Perkecil
🔍	Perbesar Ke Lapisan	🔍	Perbesaran Terakhir
🔍	Perbesar Selanjutnya		Tautan Georeferencer ke QGIS
	Tautan QGIS ke Georeferencer		

Tabel Georeferensi 1: Alat-Alat Georeferensi

19.9.1 Prosedur biasa

Sebagai koordinat X dan Y (DMS (dd mm ss.ss), DD (dd.dd) atau koordinat diproyeksikan (mmmm.mm) yang sesuai dengan titik yang dipilih pada gambar, dua alternatif prosedur dapat digunakan:

- Raster itu sendiri kadang-kadang memberikan salib dengan koordinat "written" pada gambar. Dalam hal ini Anda dapat memasukkan koordinat secara manual.
- Menggunakan lapisan sudah bergeoreferensi, hal ini dapat berupa data vektor atau raster yang berisi benda-benda yang sama/fitur yang Anda miliki pada gambar yang ingin Anda Georeferensi dan proyeksi. Dalam hal ini Anda dapat memasukkan koordinat dengan mengklik pada dataset referensi dimuat dalam kanvas peta QGIS.

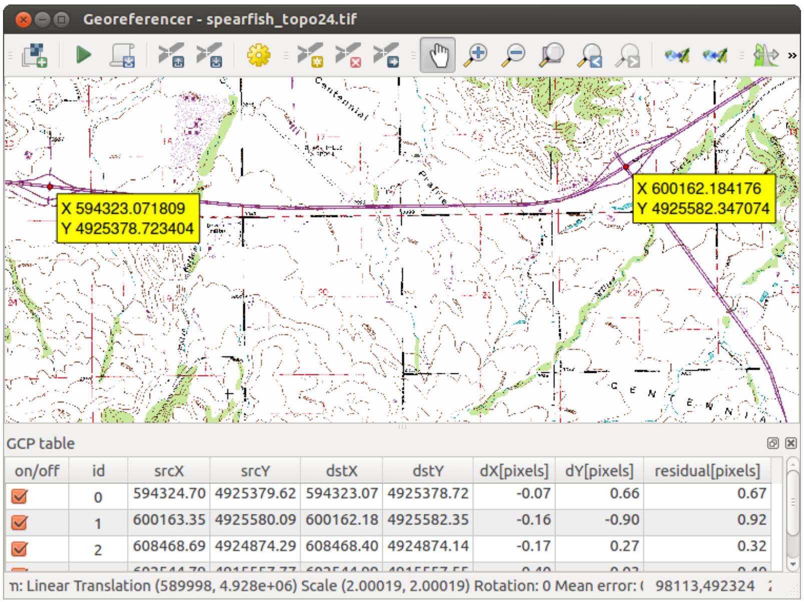
Prosedur yang biasa untuk Georeferensi gambar memilih beberapa poin pada raster, menentukan koordinat mereka, dan memilih jenis transformasi yang relevan. Berdasarkan parameter masukan dan data, plugin akan menghitung parameter berkas dunia. Semakin banyak titik koordinat Anda berikan, akan semakin baik hasilnya.

Langkah pertama untuk memulai QGIS, memuat Plugin Georeferencer (lihat Bagian *Memuat QGIS Plugin Inti*) dan klik pada ikon Georeferencer yang muncul di toolbar menu QGIS. Dialog Plugin Georeferencer muncul seperti dalam gambar figure_georeferencer_1.

Untuk contoh ini, kita menggunakan toposheet South Dakota dari SDGS. Hal ini nantinya dapat divisualisasikan bersama dengan data dari lokasi GRASS `spearfish60`. Anda dapat menngunduh toposheet di sini: http://grass.osgeo.org/sampledata/spearfish_toposheet.tar.gz.

Memasukkan titik-titik kontrol lapangan (GCPs)

1. Untuk memulai georeferensi sebuah raster rintisan, kita harus memuat dengan menggunakan tombol . Raster akan muncul di wilayah kerja utama dialog. Setelah raster dimuat, kita bisa mulai untuk memasukkan titik-titik acuan.

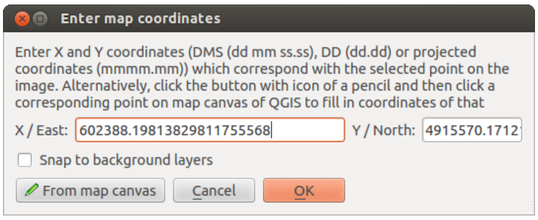


on/off	id	srcX	srcY	dstX	dstY	dX[pixels]	dY[pixels]	residual[pixels]
☑	0	594324.70	4925379.62	594323.07	4925378.72	-0.07	0.66	0.67
☑	1	600163.35	4925580.09	600162.18	4925582.35	-0.16	-0.90	0.92
☑	2	608468.69	4924874.29	608468.40	4924874.14	-0.17	0.27	0.32

n: Linear Translation (589998, 4.928e+06) Scale (2.00019, 2.00019) Rotation: 0 Mean error: (98113,492324

Gambar 19.13: Dialog Plugin Georeferencer

2. Menggunakan tombol Tambah Poin, menambahkan poin-poin untuk wilayah kerja utama dan memasukkan koordinat mereka (lihat Gambar figure_georeferencer_2). Untuk prosedur ini, Anda memiliki tiga pilihan:
    - Klik pada poin di gambar raster dan masukkan koordinat X dan Y secara manual.
    - Klik pada poin gambar raster dan pilih tombol dari kanvas peta untuk menambahkan koordinat X dan Y dengan bantuan peta georeferensi sudah dimuat dalam kanvas peta QGIS.
    - Dengan tombol , Anda bisa menggeser GCP di dalam jendela, jika mereka berada di tempat yang salah.
3. Lanjutkan memasukkan titik-titik. Anda harus memiliki setidaknya 4 poin, dan semakin banyak koordinat yang dapat Anda berikan, akan semakin baik hasilnya. Ada alat tambahan pada dialog plugin untuk memperbesar dan menggeser wilayah kerja dalam rangka untuk mencari satu set titik GCP relevan.



Enter X and Y coordinates (DMS (dd mm ss.ss), DD (dd.dd) or projected coordinates (mmmm.mm)) which correspond with the selected point on the image. Alternatively, click the button with icon of a pencil and then click a corresponding point on map canvas of QGIS to fill in coordinates of that

X / East: 602388.19813829811755568

Y / North: 4915570.1712

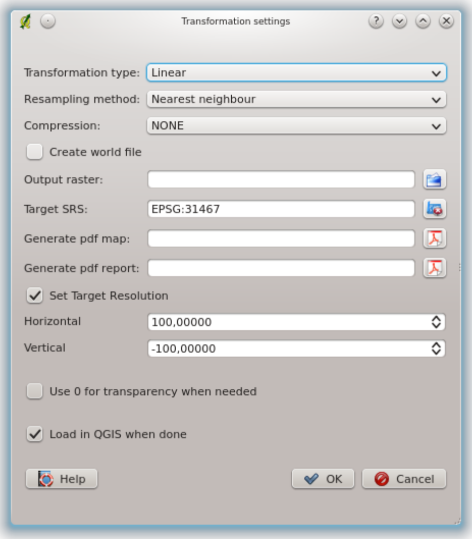
☐ Snap to background layers

Gambar 19.14: Tambahkan titik-titik ke gambar raster

Poin-poin yang ditambahkan ke peta akan disimpan dalam sebuah berkas teks yang terpisah (`[filename].points`) biasanya bersama-sama dengan gambar raster. Hal ini memungkinkan kita untuk membuka kembali plugin Georeferencer di kemudian hari dan menambah poin baru atau menghapus yang sudah ada untuk mengoptimalkan hasilnya. Berkas poin berisi nilai-nilai dalam bentuk: `mapX, mapY, pixelX, pixelY`. Anda bisa menggunakan tombol-tombol Muat poin-poin GCP dan Simpan poin GCP sebagai untuk mengelola berkas.

Pengaturan mendefinisikan transformasi

Setelah Anda telah menambahkan GCPs Anda ke gambar raster, Anda harus menentukan pengaturan transformasi untuk proses georeferensi.



Transformation settings

Transformation type: Linear

Resampling method: Nearest neighbour

Compression: NONE

☐ Create world file

Output raster:

Target SRS: EPSG:31467

Generate pdf map:

Generate pdf report:

☑ Set Target Resolution

Horizontal 100,00000

Vertical -100,00000

☐ Use 0 for transparency when needed

☑ Load in QGIS when done

Gambar 19.15: Pengaturan mendefinisikan transformasi

Algoritma Transformasi Tersedia

Tergantung pada berapa banyak titik kontrol lapangan yang telah direkam, Anda mungkin ingin menggunakan algoritma transformasi yang berbeda. Pilihan algoritma transformasi juga tergantung pada jenis dan kualitas masukan data dan jumlah distorsi geometris Anda bersedia untuk memasukkan kepada hasil akhir.

Saat ini, berikut ini *Tipe-tipe Transformasi* tersedia:

- Algoritma **Linear** adalah digunakan untuk membuat berkas-dunia, dan berbeda dari algoritma yang lain, karena tidak benar-benar mengubah raster. Algoritma ini kemungkinan besar tidak akan cukup jika Anda berurusan dengan bahan yang dipindai.
- Transformasi **Helmert** melakukan scaling dan rotasi transformasi sederhana.
- Algoritma 1-3 **Polynomial** yang paling banyak digunakan algoritma yang diperkenalkan untuk mencocokkan sumber dan tujuan poin kontrol lapangan. Paling banyak digunakan algoritma polinomial adalah urutan kedua transformasi polinomial, yang memungkinkan beberapa kelengkungan. Urutan pertama transformasi polinomial (affine) mempertahankan collinearity dan memungkinkan scaling, terjemahan dan rotasi saja.
- Algoritma **Thin Plate Spline** (TPS) adalah adalah metode georeferencing yang lebih modern, yang mampu memperkenalkan deformasi lokal dalam data. Algoritma ini berguna ketika kualitas asli sangat rendah sebagai rujukan geografis.
- Transformasi **Proyektif** rotasi linear dan terjemahan koordinat.

Tentukan metode Sampel ulang

Jenis resampling Anda memilih kemungkinan akan tergantung pada data masukan Anda dan tujuan akhir dari latihan. Jika Anda tidak ingin mengubah statistik dari gambar, Anda mungkin ingin memilih 'Nearest neighbour', sedangkan 'resampling Cubic' kemungkinan akan memberikan hasil yang lebih rapi.

Hal ini dimungkinkan untuk memilih lima metode resampling yang berbeda.

1. Nearest neighbour
2. Linear
3. Cubic

4. Cubic Spline
5. Lanczos

Tentukan pengaturan transformasi

Ada beberapa opsi yang perlu didefinisikan untuk keluaran raster georeferensi.

- Kotak centang ☑ *Buat berkas dunia* hanya tersedia, jika Anda memutuskan untuk menggunakan jenis transformasi linear, karena ini berarti bahwa gambar raster sebenarnya tidak akan berubah. Dalam hal ini, kolom *Keluaran raster* tidak diaktifkan, karena hanya berkas dunia baru yang akan dibuat.
- Untuk semua jenis transformasi lain Anda harus mendefinisikan *Keluaran raster*. Sebagai default berkas baru ([filename]_modified) akan dibuat dalam folder yang sama bersama-sama dengan gambar raster asli.
- Sebagai langkah berikutnya Anda harus menentukan *Target SRS* (Spatial Reference System) untuk georeferensi raster (lihat bagian *Working with Projections*),
- Jika Anda ingin, Anda bisa **menghasilkan peta pdf** dan juga **laporan pdf**. Laporan ini mencakup informasi tentang parameter transformasi yang digunakan. Sebuah gambar dari residual dan daftar dengan semua GCP dan eror RMS.
- Selanjutnya Anda dapat mengaktifkan kotak centang ☑ *Atur Target Resolusi* dan tentukan pixel resolusi dari keluaran raster. Resolusi horisontal dan vertikal default adalah 1,
- ☑ *Gunakan 0 untuk transparan jika dibutuhkan* bisa diaktifkan, jika pixel dengan nilai 0 akan divisualisasikan transparan. Dalam contoh toposheet kami semua bidang putih akan jadi transparan.
- Akhirnya ☑ *muat di |qg| saat selesai* muat keluaran raster secara otomatis ke dalam kanvas Peta QGIS ketika transformasi sudah dilakukan.

Tampilkan dan menyesuaikan properti raster

Mengklik ada dialog *Raster properti* didalam menu *Pengaturan* membuka properti raster dari lapisan yang ingin Anda Georeferensi.

Konfigurasi georeferensi

- Anda dapat menentukan apakah Anda ingin menunjukkan koordinat GCP dan/atau ID.
- Sebagai unit sisa piksel dan unit peta dapat dipilih.
- Untuk laporan PDF margin kiri dan kanan dapat didefinisikan dan Anda juga dapat mengatur ukuran kertas untuk peta PDF.
- Akhirnya Anda bisa mengaktifkan ☑ *show georeferencer window docked*.

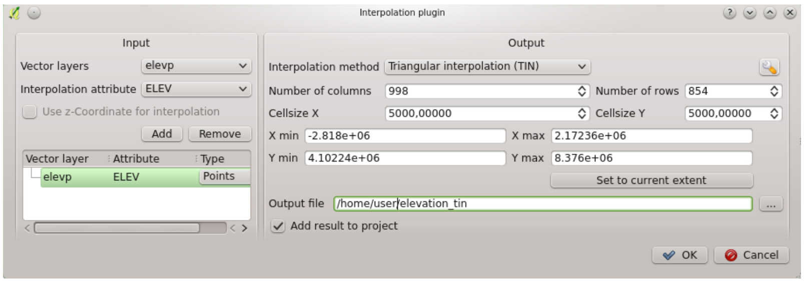
Menjalankan transformasi

Setelah semua GCPs telah dikumpulkan dan semua pengaturan transformasi didefinisikan, tekan tombol ▶ Mulai Georeferensi untuk membuat raster baru bergeoreferensi.

19.10 Plugin Interpolasi

Plugin Interpolasi dapat digunakan untuk membuat interpolasi TIN atau IDW dari suatu layer vektor titik. Plugin ini sangat sederhana serta menyediakan tampilan antarmuka yang intuitif untuk membuat layer raster terinterpolasi (lihat Figure_interpolation_1). Plugin ini memerlukan parameter-parameter berikut sebelum dapat dijalankan:

- Masukan **Lapisan-lapisan Vektor**: Tentukan masukan lapisan vektor titik dari daftar lapisan titik yang dimuat. Jika beberapa lapisan ditentukan, maka data dari semua lapisan yang digunakan untuk interpolasi. Catatan: Hal ini dimungkinkan untuk menyisipkan baris atau poligon untuk triangulasi, dengan menentukan "titik", "garis struktur" atau "baris break" dalam combobox *Tipe* .
- **Atribut interpolasi**: Pilih kolom atribut untuk digunakan dalam interpolasi atau aktifkan checkbox ☑ *Gunakan koordinat-Z* untuk menggunakan nilai Z yang tersimpan pada layer.
- **Metode Interpolasi**: Pilih metode interpolasi. Pilihannya antara lain 'Triangulated Irregular Network (TIN)' atau 'Inverse Distance Weighted (IDW)'.
- **Jumlah kolom/baris**: masukkan jumlah kolom dan baris untuk file raster keluaran.
- **File keluaran**: Masukkan nama untuk file raster yang dihasilkan.
- ☑ *Tambah hasil ke proyek* untuk memuat hasil kedalam kanvas peta.



Vector layers: elevp
Interpolation attribute: ELEV
☐ Use z-Coordinate for interpolation

Vector layer	Attribute	Type
elevp	ELEV	Points

Interpolation method: Triangular interpolation (TIN)
Number of columns: 998
Number of rows: 854
Cellsize X: 5000,00000
Cellsize Y: 5000,00000
X min: -2.818e+06
X max: 2.17236e+06
Y min: 4.10224e+06
Y max: 8.376e+06
Output file: /home/user/elevation_tin
☑ Add result to project

Gambar 19.16: Plugin Interpolasi

19.10.1 Menggunakan plugin interpolasi

1. Mulai QGIS dan muat lapisan vektor titik (seperti `elevp.csv`).
2. Muat plugin interpolasi di Pengelola Plugin (lihat Bagian *Memuat QGIS Plugin Inti*) dan klik pada ikon Interpolasi yang muncul dalam menu toolbar QGIS. Dialog plugin Interploasi ditunjukkan dalam Figure_interpolation_1.
3. Pilih layer masukan (seperti *elevp*) dan kolom (seperti `ELEV`) untuk interpolasi.
4. Pilih metode interpolasi (seperti 'Triangulated Irregular Network (TIN)'), dan masukkan ukuran sel 5000 serta isikan juga nama file keluaran (seperti, `elevation_tin`).
5. Klik **[OK]**.

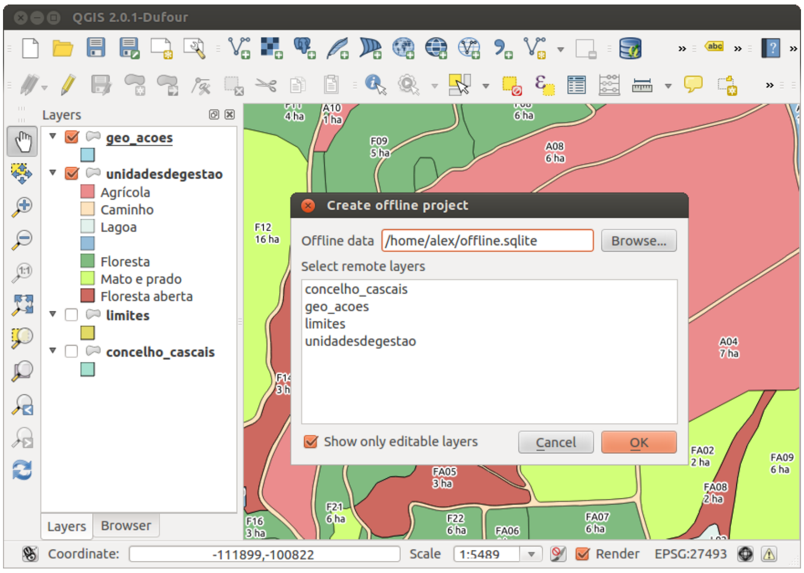
19.11 Plugin Mengedit Diluar Jaringan (Offline)

Untuk pengumpulan data merupakan situasi umum bekerja dengan laptop atau ponsel di luar jaringan (offline) di lapangan. Setelah kembali ke jaringan, perubahan perlu disinkronkan dengan sumber data master, misalnya basisdata PostGIS. Jika beberapa orang bekerja secara bersamaan pada dataset yang sama, sulit untuk menggabungkan hasil edit dengan tangan, bahkan jika orang tidak mengubah fitur yang sama.

Plugin Mengedit Offline Plugin secara otomatis melakukan sinkronisasi dengan menyalin isi dari sumber data (biasanya PostGIS atau WFS-T) ke basisdata SpatiaLite dan menyimpan suntingan luar jaringan (offline) ke tabel khusus. Setelah terhubung ke jaringan lagi, memungkinkan untuk menerapkan secara suntingan luar jaringan (offline) ke dataset induk.

19.11.1 Menggunakan plugin

- Buka beberapa lapisan vektor, misal dari sumber data PostGIS atau WFS-T
- Menyimpannya sebagai proyek
- Tekan ikon the Konversikan ke proyek luar jaringan dan pilih lapisan untuk menyimpan. Isi dari lapisan disimpan ke tabel SpatiaLite.
- Edit lapisan luar jaringan.
- Setelah terhubung lagi, mengunggah perubahan dengan tombol Synchronize.


QGIS 2.0.1-Dufour
Layers
geo_acoes
unidadesdegestao
Agrícola
Caminho
Lagoa
Floresta
Mato e prado
Floresta aberta
limites
concelho_cascais
Layers
Browser
F09
5 ha
A08
6 ha
F12
16 ha
A04
7 ha
FA02
2 ha
FA09
6 ha
FA08
2 ha
FA05
3 ha
F21
6 ha
F22
6 ha
FA06
FA07
6 ha
F16
3 ha

Create offline project

Offline data: /home/alex/offline.sqlite Browse...

Select remote layers

concelho_cascais
geo_acoes
limites
unidadesdegestao

☑ Show only editable layers

Cancel OK

Coordinate: -111899,-100822 Scale 1:5489 ☑ Render EPSG:27493

Gambar 19.17: Membuat proyek luar jaringan dari lapisan PostGIS atau WFS

19.12 Oracle GeoRaster Plugin

In Oracle databases, raster data can be stored in SDO_GEORASTER objects available with the Oracle Spatial extension. In QGIS, the OracleGeoRasterPlugin is supported by GDAL, and depends on Oracle's database product being installed and working on your machine. While Oracle is proprietary software, they provide their software free for development and testing purposes. Here is one simple example of how to load raster images to GeoRaster:

```
$ gdal_translate -of georaster input_file.tif geor:scott/tiger@orcl
```

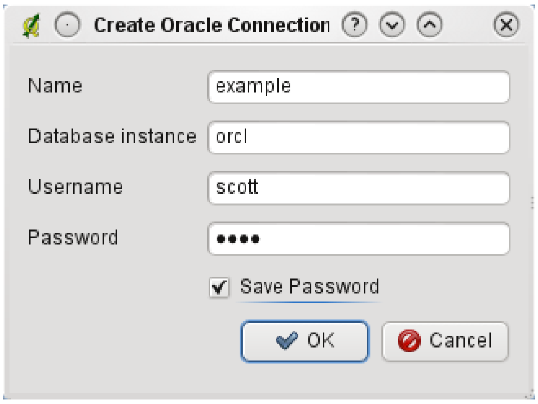
This will load the raster into the default GDAL_IMPORT table, as a column named `RASTER`.

19.12.1 Managing connections

Firstly, the Oracle GeoRaster Plugin must be enabled using the Plugin Manager (see Section *Memuat QGIS Plugin Inti*). The first time you load a GeoRaster in QGIS, you must create a connection to the Oracle database that contains the data. To do this, begin by clicking on the Select GeoRaster toolbar button, it will open the *Select Oracle Spatial GeoRaster* dialog window. Click on **[New]** to open the dialog window, and specify the connection parameters (See Figure_oracle_raster_1):

- **Name**: Enter a name for the database connection
- **Database instance**: Enter the name of the database that you will connect to
- **Username**: Specify your own username that you will use to access the database

- **Password**: The password associated with your username that is required to access the database



Name: example
Database instance: orcl
Username: scott
Password: ••••
☑ Save Password

Gambar 19.18: Create Oracle connection dialog

Now, back on the main *Oracle Spatial GeoRaster* dialog window (see Figure_oracle_raster_2), use the drop-down list to choose one connection, and use the **[Connect]** button to establish a connection. You may also **[Edit]** the connection by opening the previous dialog and making changes to the connection information, or use the **[Delete]** button to remove the connection from the drop-down list.

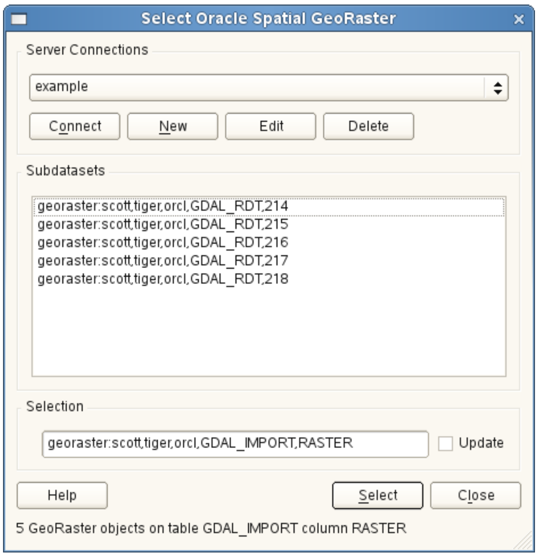
19.12.2 Selecting a GeoRaster

Once a connection has been established, the sub-datasets window will show the names of all the tables that contains GeoRaster columns in that database in the format of a GDAL subdataset name.

Click on one of the listed subdatasets and then click on **[Select]** to choose the table name. Now another list of subdatasets will show with the names of GeoRaster columns on that table. This is usually a short list, since most users will not have more than one or two GeoRaster columns on the same table.

Click on one of the listed subdatasets and then click on **[Select]** to choose one of the the table/column combination. The dialog will now show all the rows that contains GeoRaster objects. Note that the subdataset list will now show the Raster Data Table and Raster Id's pairs.

At anytime the Selection entry can be edited in order to go directly to a known GeoRaster or to go back to the beginning and select another table name.



Server Connections: example

Subdatasets:
georaster:scott,tiger,orcl,GDAL_RDT,214
georaster:scott,tiger,orcl,GDAL_RDT,215
georaster:scott,tiger,orcl,GDAL_RDT,216
georaster:scott,tiger,orcl,GDAL_RDT,217
georaster:scott,tiger,orcl,GDAL_RDT,218

Selection: georaster:scott,tiger,orcl,GDAL_IMPORT,RASTER ☐ Update

5 GeoRaster objects on table GDAL_IMPORT column RASTER

Gambar 19.19: Select Oracle GeoRaster dialog

The Selection data entry can also be used to enter a `WHERE` clause at the end of the identification string, e.g. `geor:scott/tiger@orcl,gdal_import,raster,geoid=`. See http://www.gdal.org/frmt_georaster.html for more information.

19.12.3 Displaying GeoRaster

Finally, by selecting a GeoRaster from the list of Raster Data Table and Raster Id's, the raster image will be loaded into QGIS.

The *Select Oracle Spatial GeoRaster* dialog can be closed now and next time it opens it will keep the same connection, and will show the same previous list of subdataset making it very easy to open up another image from the same context.

Catatan: GeoRasters that contains pyramids will display much faster but the pyramids need to be generated outside of QGIS using Oracle PL/SQL or gdaladdo.

The following is example using `gdaladdo`:

```
gdaladdo georaster:scott/tiger@orcl,georaster\_table,georaster,georid=6 -r nearest 2 4 6 8 16 32
```

This is an example using PL/SQL:

```
$ sqlplus scott/tiger
SQL> DECLARE
 gr sdo_georaster;
BEGIN
    SELECT image INTO gr FROM cities WHERE id = 1 FOR UPDATE;
    sdo_geor.generatePyramid(gr, 'rLevel=5, resampling=NN');
    UPDATE cities SET image = gr WHERE id = 1;
    COMMIT;
END;
```

19.13 Plugin Raster Analisis Terrain

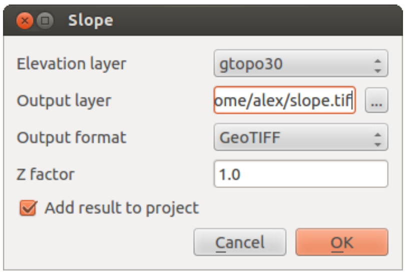
Plugin Raster Analisis Terrain dapat digunakan untuk menghitung kemiringan, aspek, bayangan bukit, indeks kekasaran dan relief untuk model elevasi digital (DEM). Sangat sederhana menangani dan menyediakan grafis antarmuka pengguna intuitif untuk membuat lapisan raster baru (Lihat Figure_raster_terrain_1).

Deskripsi dari analisis:

- **Lereng**: Menghitung sudut kemiringan untuk setiap sel dalam derajat (berdasarkan urutan pertama estimasi derivatif).
- **Aspek**: Eksposisi (dimulai dengan 0 untuk arah utara, dalam derajat berlawanan jarum jam).
- **Bukitbayangan**: Buat peta berbayang menggunakan cahaya dan bayangan untuk memberikan penampilan lebih tiga dimensi untuk peta relief berbayang.
- **Indeks Ketidakrataan**: Sebuah pengukuran kuantitatif dari medan heterogenitas seperti yang dijelaskan oleh Riley et al. (1999). Hal ini dihitung untuk setiap lokasi, dengan meringkas perubahan elevasi dalam kisi 3x3 piksel.
- **Relief**: Membuat peta relief berbayang dari data elevasi digital. Diimplementasikan metode memilih warna elevasi menganalisis frekuensi distribusi.

19.13.1 Menggunakan plugin

1. Mulai QGIS dan muat layer raster `gtopo30` dari contoh lokasi GRASS.



gtopo30
ome/alex/slope.tif
GeoTIFF
1.0
☑ Add result to project

Gambar 19.20: Plugin Raster Pemodelan Terrain (perhitungan kemiringan)

2. Muat plugin Raster Analisis Terrain plugin di Pengelola Plugin (lihat Bagian *Memuat QGIS Plugin Inti*)
3. Pilih metode analisis dari menu (e.g. *Raster* → *Analisis Terrain* → *Kemiringan*). Dialog *Kemiringan* seperti dalam gambar Figure_raster_terrain_1.
4. Spesifikasi keluaran berkas path dan keluaran tipe berkas:
5. Klik **[OK]**.

19.14 Heatmap Plugin

The *Heatmap* plugin uses Kernel Density Estimation to create a density (heatmap) raster of an input point vector layer. The density is calculated based on the number of points in a location, with larger numbers of clustered points resulting in larger values. Heatmaps allow easy identification of "hotspots" and clustering of points.

19.14.1 Activate the Heatmap plugin

First this core plugin needs to be activated using the Plugin Manager (see Section *Memuat QGIS Plugin Inti*). After activation the heatmap icon can be found in the Raster Toolbar, and under the *Raster* → *Heatmap* menu. Select the menu *View* → *Toolbars* → *Raster* to show the Raster Toolbar if it is not visible.

19.14.2 Using the Heatmap plugin

Clicking the *Heatmap* toolbutton opens the Heatmap plugin dialog (see figure_heatmap_2).

The dialog has the following options:

- **Input point layer**: lists all the vector point layers in the current project and is used to select the layer to be analysed.
- **Output raster**: use the ... button to select the folder and file name for the output raster the Heatmap plugin generates. A file extension is not required.
- **Output format**: selects the output format. Although all formats supported by GDAL can be choosen, in most cases GeoTIFF is the best format to choose.
- **Radius**: used to specify the heatmap search radius (or kernel bandwidth) in meters or map units. The radius specifies the distance around a point at which the influence of the point will be felt. Larger values result in greater smoothing, but smaller values may show finer details and variation in point density.

When the ☑ *Advanced* checkbox is checked additional options will be available:

- **Rows** and **Columns**: used to change the dimensions of the output raster. These values are also linked to the **Cell size X** and **Cell size Y** values. Increasing the number of rows or colums will decrease the cell size and increase the file size of the output file. The values in Rows and Columns are also linked, so doubling the number of rows will automatically double the number of columns and the cell sizes will also be halved. The geographical area of the output raster will remain the same!

- **Cell size X** and **Cell size Y**: control the geographic size of each pixel in the output raster. Changing these values will also change the number of Rows and Columns in the output raster.
- **Kernel shape**: The kernel shape controls the rate at which the influence of a point decreases as the distance from the point increases. Different kernels decay at different rates, so a triweight kernel gives features greater weight for distances closer to the point then the Epanechnikov kernel does. Consequently, triweight results in “sharper” hotspots, and Epanechnikov results in “smoother” hotspots. A number of standard kernel functions are available in QGIS, which are described and illustrated on Wikipedia.
- **Decay ratio**: can be used with Triangular kernels to futher control how heat from a feature decreases with distance from the feature.
  - A value of 0 (=minimum) indicates that the heat will be concentrated in the centre of the given radius and be completely extinguished at the edge.
  - A value of 0.5 indicates that pixels at the edge of the radius will be given half the heat as pixels at the centre of the search radius.
  - A value of 1 means the heat is spread evenly over the whole search radius circle. (This is equivalent to the ‘Uniform’ kernel.)
  - A value greater than 1 indicates that the heat is higher towards the edge of the search radius then at the centre.

The input point layer may also have attribute fields which can affect how they influence the heatmap:

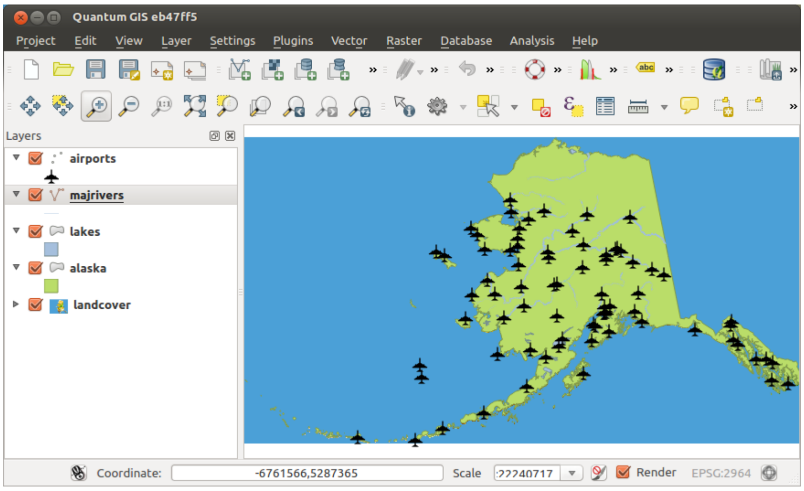
- **Use radius from field**: sets the search radius for each feature from an attribute field in the input layer.
- **Use weight from field**: allows input features to be weighted by an attribute field. This can be used to increase the influence certain features have on the resultant heatmap.

When an output raster file name is specified, the **[OK]** button can be used to create the heatmap.

19.14.3 Tutorial: Creating a Heatmap

For the following example we will use the `airports` vector point layer from the QGIS sample dataset (see *Contoh data*). Another excellent QGIS tutorial on making heatmaps can be found at http://qgis.spatialthoughts.com.

In Figure_Heatmap_1 the airports of Alaska are shown.



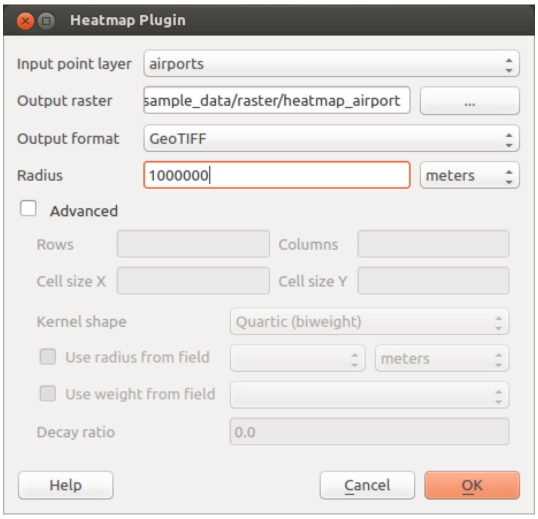
Coordinate: -6761566,5287365

Scale :22240717

Gambar 19.21: Airports of Alaska

1. Select the *Heatmap* toolbutton to open the Heatmap dialog (see Figure_Heatmap_2).

2. In the *Input point layer* field select `airports` from the list of point layers loaded in current project.
3. Specify an output file name by clicking the button next to the *Output raster* field. Enter the file name `heatmap_airports` (no file extension is necessary).
4. Leave the *Output format* as the default format, `GeoTIFF`.
5. Change the *Radius* to `1000000` meters.
6. Click on **[OK]** to create and load the airports heatmap (see Figure_Heatmap_3).



Heatmap Plugin

Input point layer: airports

Output raster: sample_data/raster/heatmap_airport

Output format: GeoTIFF

Radius: 1000000 meters

☐ Advanced

Rows

Columns

Cell size X

Cell size Y

Kernel shape: Quartic (biweight)

☐ Use radius from field: meters

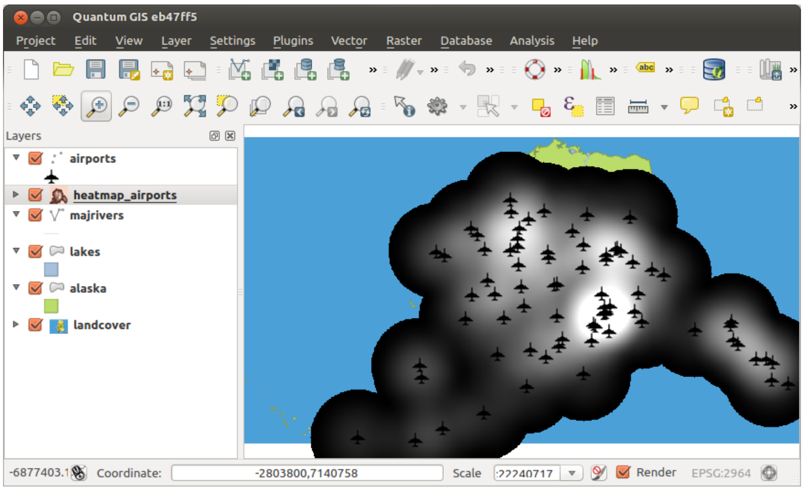
☐ Use weight from field

Decay ratio: 0.0

...
Help
Cancel
OK

Gambar 19.22: The Heatmap Dialog

QGIS will generate the heatmap and add the results to your map window. By default, the heatmap is shaded in greyscale, with lighter areas showing higher concentrations of airports. The heatmap can now be styled in QGIS to improve its appearance.



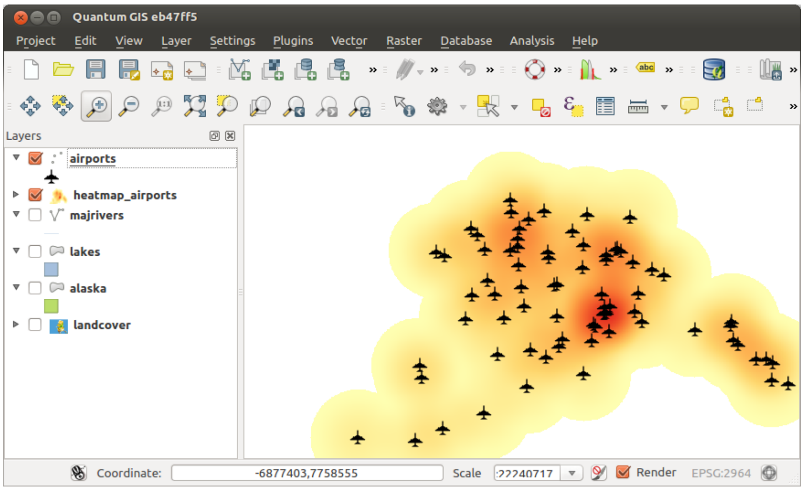
Quantum GIS eb47ff5
Project
Edit
View
Layer
Settings
Plugins
Vector
Raster
Database
Analysis
Help
Layers
airports
heatmap_airports
majrivers
lakes
alaska
landcover
-6877403.1
Coordinate:
-2803800,7140758
Scale
22240717
Render
EPSG:2964

Gambar 19.23: The heatmap after loading looks like a grey surface

1. Open the properties dialog of the `heatmap_airports` layer (select the layer `heatmap_airports`, open the context menu with the right mouse button and select *Properties*).
2. Select the *Style* tab.
3. Change the *Render type* to 'Singleband pseudocolor'.
4. Select a suitable *Color map*, for instance `YlOrRed`.

5. Click the **[Load]** button to fetch the minimum and maximum values from the raster, then click the **[Classify]** button.
6. Press **[OK]** to update the layer.

The final result is shown in Figure_Heatmap_4.


Quantum GIS eb47ff5
Project
Edit
View
Layer
Settings
Plugins
Vector
Raster
Database
Analysis
Help
Layers
airports
heatmap_airports
majrivers
lakes
alaska
landcover
Coordinate:
Scale
Render
EPSG:2964

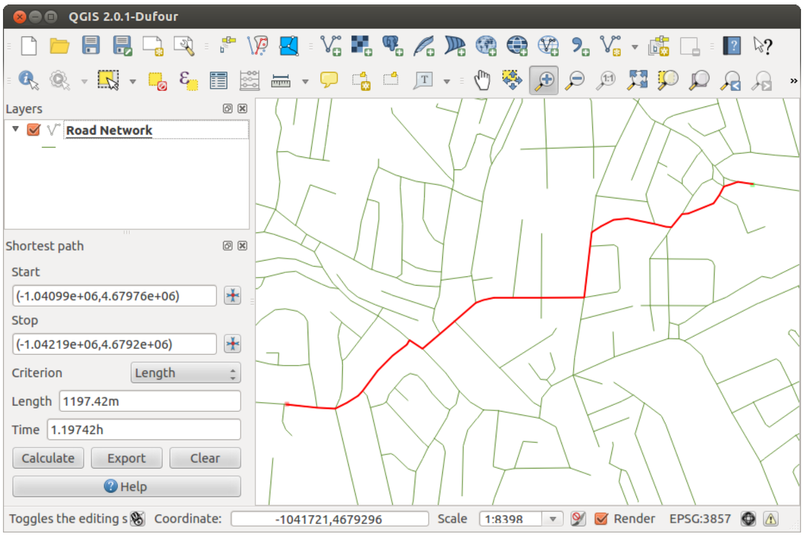
Coordinate: -6877403,7758555

Scale :22240717

Gambar 19.24: Styled heatmap of airports of Alaska

19.15 Plugin Grafik Jalan

Plugin Grafik Jalan merupakan plugin C++ untuk QGIS, yang menghitung jalur terpendek antara dua titik pada setiap lapisan polyline dan plot jalan ini melalui jaringan jalan.


QGIS 2.0.1-Dufour
Layers
Road Network
Shortest path
Calculate
Export
Clear
Help
Toggles the editing s
Render
EPSG:3857

Start: (-1.04099e+06,4.67976e+06)

Stop: (-1.04219e+06,4.6792e+06)

Criterion: Length

Length: 1197.42m

Time: 1.19742h

Coordinate: -1041721,4679296

Scale: 1:8398

Gambar 19.25: Plugin Grafik Jalan

Fitur Utama:

- menghitung path, panjang dan waktu travel
- Mengoptimalkan dari panjang atau dari waktu travel
- ekspor path ke lapisan vektor
- arah jalan highlight (ini lambat dan digunakan terutama untuk tujuan debug dan untuk pengujian pengaturan)

Seperti lapisan jalan Anda bisa menggunakan setiap lapisan vektor polyline dalam format yang didukung QGIS. Dua garis dengan titik umum dianggap terhubung. Harap dicatat, ini diperlukan untuk menggunakan CRS lapisan sebagai CRS proyek ketika mengedit lapisan jalan. Hal ini disebabkan fakta bahwa perhitungan koordinat antara CRS yang berbeda memperkenalkan beberapa kesalahan yang dapat mengakibatkan diskontinuitas, bahkan ketika 'snapping' digunakan.

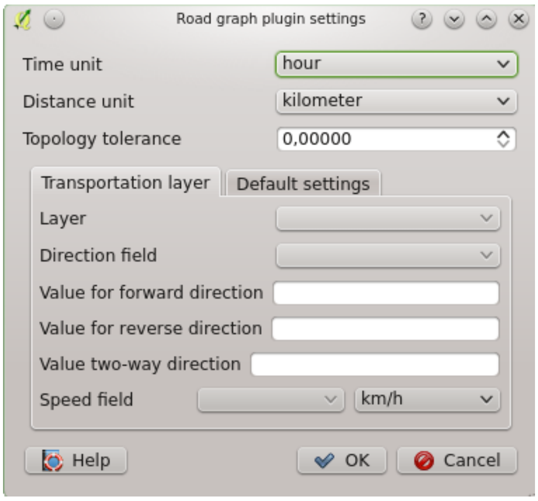
Dalam tabel lapisan atribut kolom berikut dapat digunakan:

- kecepatan pada bagian jalan — kolom numerik;
- arah — jenis, yang dapat dicor ke string. Arah maju dan mundur yang sesuai dengan jalan satu arah, dua arah — dua arah jalan

Jika beberapa bidang tidak memiliki nilai apapun atau tidak ada — nilai standar yang digunakan. Anda dapat mengubah default dan beberapa pengaturan plugin di dialog pengaturan plugin.

19.15.1 Menggunakan plugin

Setelah Plugin aktif Anda akan melihat sebuah panel tambahan di sisi kiri dari jendela utama QGIS. Sekarang membuat beberapa definisi dialog *Pengaturan plugin grafik jalan* di menu *Vektor* → *Grafik Jalan* (lihat figure_road_graph_2).



Road graph plugin settings

Time unit: hour

Distance unit: kilometer

Topology tolerance: 0,00000

Gambar 19.26: Pengaturan plugin grafik jalan

Setlah mengatur *Satuan waktu*, *Satuan Jarak* dan *Toleransi topologi* Anda bisa memilih lapisan vektor di tab *Lapisan transportasi*. Disini Anda juga bisa memilih *Kolom Arah* dan *Kolom Kecepatan*. Dalam tab *Pengaturan standar* Anda bisa mengatur *Arah* untuk menghitung.

Akhirnya pada panel *Shortest Path* pilih mulai dan titik Berhenti di lapisan jaringan jalan dan klik **[Hitung]**.

19.16 Plugin Spasial Query

Plugin Spasial Query memungkinkan untuk membuat query spasial (pilih fitur) di lapisan sasaran dengan mengacu pada lapisan lain. Fungsi ini didasarkan pada perpustakaan GEOS dan tergantung pada sumber fitur lapisan yang dipilih.

Operator yang mungkin adalah:

- Isi
- Sama
- Tumpang tindih

- Persilangan
- Berpotongan
- Memisah
- Bersinggungan
- Di dalam

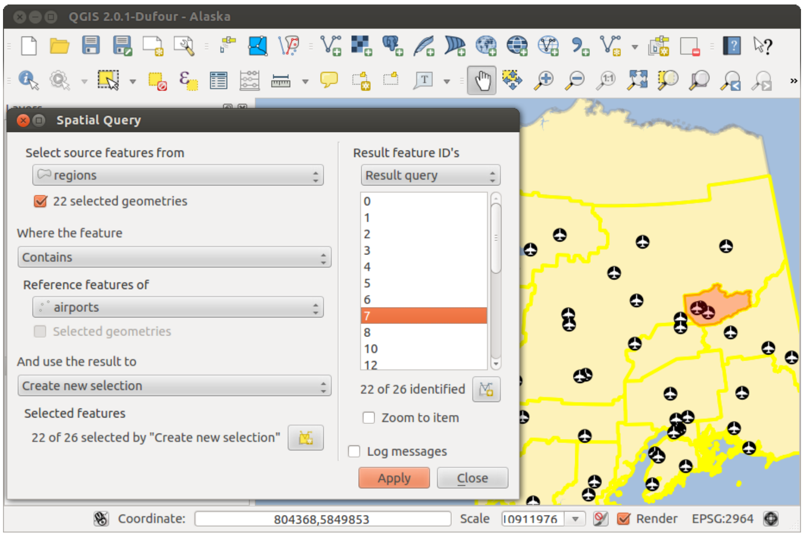
19.16.1 Menggunakan plugin

Sebagai contoh, kita ingin mencari daerah dalam dataset Alaska yang mengandung bandara. Langkah-langkah berikut diperlukan:

1. Mulai QGIS dan muat lapisan vektor `regions.shp` dan `airports.shp`.
2. Muat Plugin Spasial Query dari Pengelola Plugin (Lihat Bagian *Memuat QGIS Plugin Inti*) dan klik ikon Spasial Query yang muncul di menu toolbar QGIS. Dialog plugin muncul.
3. Pilih lapisan `regions` sebagai sumber lapisan dan `airports` sebagai lapisan fitur referensi.
4. Pilih 'Isi' sebagai operator dan klik **[Terapkan]**.

Sekarang Anda mendapatkan daftar ID fitur dari query dan Anda memiliki beberapa pilihan seperti yang ditunjukkan pada figure_spatial_query_1.

- Klik pada Buat lapisan dengan daftar item
- Pilih ID dari daftar dan klik Buat lapisan yang dipilih
- Pilih 'Hapus dari seleksi sekarang' dalam kolom *Dan gunakan hasilnya* .
- Selain itu ANda juga bisa ☑ *Perbesar ke item* atau tampilkan ☑ *Pesan Log*.



Select source features from: regions

☑ 22 selected geometries

Where the feature: Contains

Reference features of: airports

☐ Selected geometries

And use the result to: Create new selection

Selected features: 22 of 26 selected by "Create new selection"

Result feature ID's: Result query

0
1
2
3
4
5
6
7
8
10
12

22 of 26 identified

☐ Zoom to item

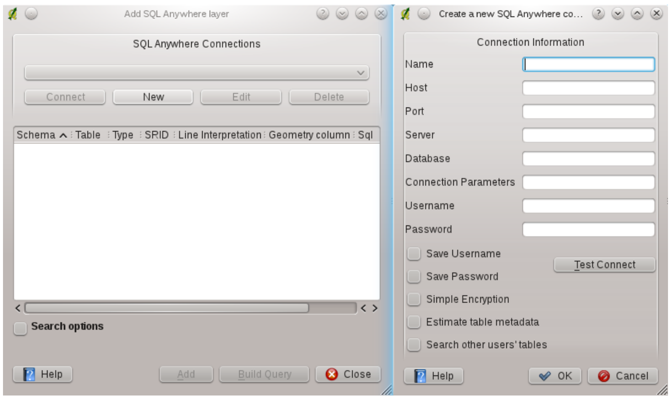
☐ Log messages

Coordinate: 804368,5849853 Scale 10911976 ☑ Render EPSG:2964

Gambar 19.27: Analisis Spasial Query - regions contain airports

19.17 Plugin SQL Anywhere

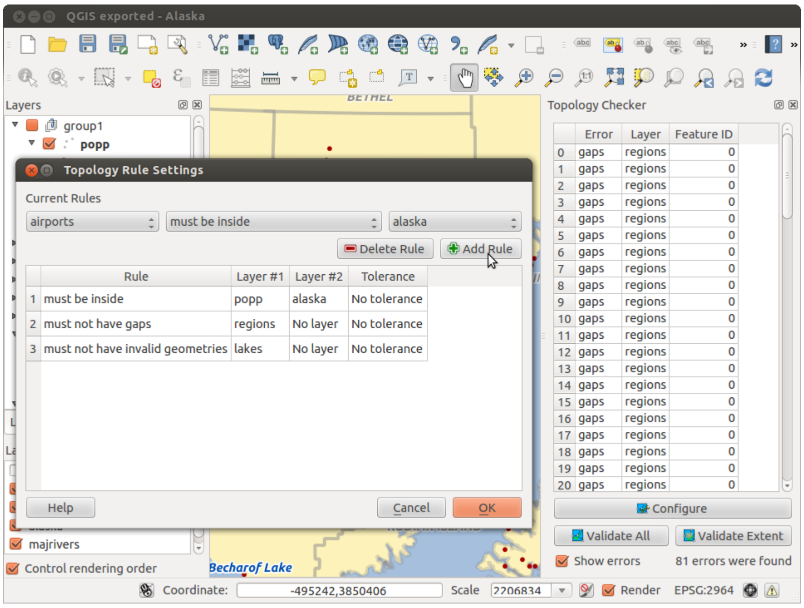
SQL Anywhere adalah relational database management system (RDBMS) proprietary dari Sybase. SQL Anywhere termasuk dukungan spasial antara lain OGC, shapefile dll dan dibangun dalam fungsi untuk ekspor ke KML, GML dan format SVG.


Add SQL Anywhere layer
SQL Anywhere Connections
Connect
New
Edit
Delete
Schema
Table
Type
SRID
Line Interpretation
Geometry column
Sql
Search options
Help
Add
Build Query
Close
Create a new SQL Anywhere co...
Connection Information
Name
Host
Port
Server
Database
Connection Parameters
Username
Password
Save Username
Test Connect
Save Password
Simple Encryption
Estimate table metadata
Search other users' tables
Help
OK
Cancel

Gambar 19.28: Dialog SQL Anywhere (KDE)

SQL Anywhere memungkinkan untuk terhubung ke spasial basisdata SQL Anywhere aktif. Dialog *Add SQL Anywhere layer* mirip dalam dialog dengan fungsi untuk PostGIS dan SpatiaLite.

19.18 Topology Checker Plugin


QGIS exported - Alaska
Layers
group1
popp
Topology Rule Settings
Current Rules
Delete Rule
Add Rule
Help
Cancel
OK
majrivers
Control rendering order
BETHEL
Becharof Lake
Topology Checker
Configure
Validate All
Validate Extent
Show errors
Render

Current Rules: airports | must be inside | alaska

	Rule	Layer #1	Layer #2	Tolerance
1	must be inside	popp	alaska	No tolerance
2	must not have gaps	regions	No layer	No tolerance
3	must not have invalid geometries	lakes	No layer	No tolerance

	Error	Layer	Feature ID
0	gaps	regions	0
1	gaps	regions	0
2	gaps	regions	0
3	gaps	regions	0
4	gaps	regions	0
5	gaps	regions	0
6	gaps	regions	0
7	gaps	regions	0
8	gaps	regions	0
9	gaps	regions	0
10	gaps	regions	0
11	gaps	regions	0
12	gaps	regions	0
13	gaps	regions	0
14	gaps	regions	0
15	gaps	regions	0
16	gaps	regions	0
17	gaps	regions	0
18	gaps	regions	0
19	gaps	regions	0
20	gaps	regions	0

81 errors were found

Coordinate: -495242,3850406 Scale 2706834 EPSG:2964

Gambar 19.29: The Topology Checker Plugin

Topology describes the relationships between points, lines and polygons that represent the features of a geographic region. With the Topology Checker plugin you can look over your vector files and check the topology with several topology rules. These rules check with spatial relations whether your features ‘Equal’, ‘Contain’, ‘Cover’, are ‘CoveredBy’, ‘Cross’, ‘Disjoint’, ‘Intersect’, ‘Overlap’, ‘Touches’ and are ‘Within’ each other. It depends on your individual questions which topology rules you apply to your vector data. E.g. normally you won’t accept overshoots in line layers but if they depict dead-end streets you won’t remove them from your vector layer.

QGIS has the built-in topological editing feature which is great for creating new features without errors. But existing data errors and user induced errors are hard to find out. This plugin helps you find out such errors through a list of rules.

It is very simple to create topology rules with the Topology Checker plugin.

On **point layers** the following rules are available:

- **must be covered by**: Here you can choose a vector layer from your project. Points that aren't covered by the given vector layer occur in the 'Error' field
- **must be covered by endpoints of**: Here you can choose a line layer from your project.
- **must be inside**: Here you can choose a polygon layer from your project. The points must be inside a polygon. Otherwise QGIS writes an 'Error' for the point.
- **must not have duplicates**: Whenever a point is represented twice or more it will occur in the 'Error' field.
- **must not have invalid geometries**: Checks whether the geometries are valid.
- **must not have multi-part-geometries**: All multi-part points are written into the 'Error' field.

On **line layers** the following rules are available:

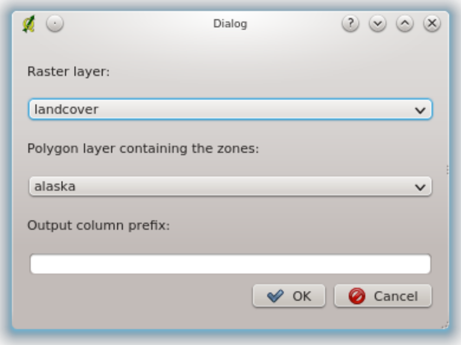
- **end points must be covered by**: Here you can select a point layer from your project.
- **must not have dangles**: This will show the overshoots in the line layer.
- **must not have duplicates**: Whenever a line feature is represented twice or more it will occur in the 'Error' field.
- **must not have invalid geometries**: Checks whether the geometries are valid.
- **must not have multi-part geometries**: Sometimes, a geometry is actually a collection of simple (single-part) geometries. Such a geometry is called multi-part geometry. If it contains just one type of simple geometry, we call it multi-point, multi-linestring or multi-polygon. All multi-part lines are written into the 'Error' field.
- **must not have pseudos**: A line geometry's endpoint should be connected to the endpoints of two other geometries. If the endpoint is connected to only one other geometry's endpoint, the endpoint is called a psuedo node.

On **polygon layers** the following rules are available:

- **must contain**: Polygon layer must contain at least one point geometry from the second layer.
- **must not have duplicates**: Polygons from the same layer must not have identical geometries. Whenever a polygon feature is represented twice or more it will occur in the 'Error' field.
- **must not have gaps**: Adjacent polygons should not form gaps between them. Administrative boundaries could be mentioned as an example (US state polygons do not have any gaps between them...).
- **must not have invalid geometries**: Checks whether the geometries are valid. Some of the rules that define a valid geometry are,
  - Polygon rings must close.
  - Rings that define holes should be inside rings that define exterior boundaries.
  - Rings may not self-intersect (they may neither touch nor cross one another).
  - Rings may not touch other rings, except at a point.
- **must not have multi-part geometries**: Sometimes, a geometry is actually a collection of simple (single-part) geometries. Such a geometry is called multi-part geometry. If it contains just one type of simple geometry, we call it multi-point, multi-linestring or multi-polygon. For example, a country consisting of multiple islands can be represented as a multi-polygon.
- **must not overlap**: Adjacent polygons should not share common area.
- **must not overlap with**: Adjacent polygons from one layer should not share common area with polygons from another layer.

19.19 Plugin Statistik Zonal

Dengan Plugin Statistik Zonal Anda dapat menganalisis hasil klasifikasi tematik. Hal ini memungkinkan untuk menghitung beberapa nilai-nilai piksel dari lapisan raster dengan bantuan lapisan vektor poligonal (lihat figure_zonal_statistics). Anda dapat menghitung jumlah, nilai rata-rata dan jumlah total piksel yang berada di dalam poligon. Plugin menghasilkan kolom keluaran dalam lapisan vektor dengan awalan user-defined.



Raster layer: landcover

Polygon layer containing the zones: alaska

Output column prefix:

Gambar 19.30: Dialog Statistik Zonal (KDE)

BAB 20

Bantuan dan Dukungan

20.1 Milis

QGIS masih aktif dikembangkan dan karena itu tidak akan selalu bekerja seperti yang Anda harapkan. Cara yang lebih disukai untuk mendapatkan bantuan adalah dengan bergabung di milis qgis-pengguna. Pertanyaan Anda akan menjangkau khalayak yang lebih luas dan jawabannya juga akan menguntungkan orang lain.

20.1.1 qgis-pengguna

Milis ini digunakan untuk membahas QGIS secara umum, serta pertanyaan-pertanyaan spesifik mengenai instalasi dan penggunaan. Anda dapat berlangganan milis qgis-pengguna dengan mengunjungi tautan URL: http://lists.osgeo.org/mailman/listinfo/qgis-user

20.1.2 fossgis-talk-liste

Untuk audien berbahasa Jerman, FOSSGIS e.V. menyediakan milis fossgis-talk-liste. Milis ini digunakan untuk diskusi GIS open source secara umum termasuk QGIS. Anda dapat berlangganan dengan mengunjungi URL: https://lists.fossgis.de/mailman/listinfo/fossgis-talk-liste

20.1.3 qgis-pengembang

Jika Anda seorang pengembang menghadapi masalah yang bersifat teknis, Anda mungkin ingin bergabung dengan milis qgis-pengembang di sini: http://lists.osgeo.org/mailman/listinfo/qgis-developer

20.1.4 qgis-commit

Setiap kali komit dibuat untuk kode repositori QGIS surel dikirim ke daftar ini. Jika Anda ingin mendapatkan informasi terbaru setiap perubahan basis kode saat ini, Anda bisa berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-commit

20.1.5 qgis-trac

Daftar ini memberikan notifikasi surel yang terkait dengan manajemen proyek, termasuk laporan bug, tugas, dan permintaan fitur. Anda dapat berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-trac

20.1.6 qgis-komunitas-tim

Daftar ini berkaitan dengan topik seperti dokumentasi, konteks bantuan, panduan-pengguna, pengalaman online termasuk situs web, blog, milis, forum, dan upaya penerjemahan. Jika Anda ingin bekerja pada panduan-pengguna juga, dalam daftar ini adalah titik awal yang baik untuk mengajukan pertanyaan Anda. Anda dapat berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-community-team

20.1.7 qgis-rilis-tim

Daftar ini berkaitan dengan topik seperti proses rilis, pemaketan binari untuk berbagai OS dan mengumumkan rilis baru ke dunia pada umumnya. Anda dapat berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-release-team

20.1.8 qgis-tr

Daftar ini berkaitan dengan upaya penerjemahan. Jika Anda ingin bekerja pada penerjemahan panduan atau grafis antarmuka pengguna (GUI), dalam daftar ini adalah titik awal yang baik untuk mengajukan pertanyaan Anda. Anda bisa berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-tr

20.1.9 qgis-edu

Daftar ini berkaitan dengan upaya pendidikan QGIS. Jika Anda ingin bekerja pada bahan pendidikan QGIS, daftar ini adalah awal yang baik untuk mengajukan pertanyaan Anda. Anda bisa berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-edu

20.1.10 qgis-psc

Daftar ini digunakan untuk membahas isu-isu Komite Pengarah yang berkaitan dengan arah dan manajemen secara keseluruhan QGIS. Anda dapat berlangganan di: http://lists.osgeo.org/mailman/listinfo/qgis-psc

Anda dipersilakan untuk berlangganan ke salah satu daftar. Harap ingat untuk berkontribusi ke dalam daftar dengan menjawab pertanyaan dan berbagi pengalaman Anda. Perhatikan bahwa qgis-commit dan qgis-trac dirancang hanya untuk pemberitahuan saja dan tidak dimaksudkan untuk mengirim surel.

20.2 IRC

Kami juga mengunakan IRC - kunjungi kami dengan bergabung dalam kanal #qgis di irc.freenode.net. Butuh waktu untuk menanggapi pertanyaan Anda karena banyak orang-orang di saluran ini melakukan hal-hal lain dan mungkin diperlukan waktu beberapa saat bagi mereka untuk melihat pertanyaan Anda. Dukungan komersial untuk QGIS juga tersedia. Periksa website http://qgis.org/en/commercial-support.html untuk informasi lebih lanjut.

Jika Anda melewatkan sebuah diskusi di IRC, tidak masalah! Kami log semua diskusi sehingga Anda dapat dengan mudah mengejar ketinggalan. Hanya pergi ke http://qgis.org/irclogs dan baca IRC-logs.

20.3 BugTracker

Sementara milis qgis-pengguna berguna untuk jenis pertanyaan umum ‘bagaimana cara melakukan XYZ di QGIS’, Anda mungkin ingin memberitahu kami tentang bug di QGIS. Anda bisa mengirimkan laporan bug menggunakan pelacak bug QGIS di http://hub.qgis.org/projects/quantum-gis/issues. Saat membuat tiket bug baru, mohon diinformasikan alamat surel dimana kami bisa meminta informasi tambahan.

Harap diingat bahwa bug Anda mungkin tidak selalu sesuai dengan prioritas Anda seperti harapan Anda (tergantung pada tingkat kesulitannya). Beberapa bug mungkin memerlukan upaya pengembang yang signifikan untuk memperbaiki dan tenaga kerja tidak selalu tersedia.

Permintaan fitur dapat disampaikan juga menggunakan sistem tiket yang sama untuk bug. Pastikan untuk memilih jenis `Feature`.

Jika Anda telah menemukan bug dan memperbaikinya sendiri Anda bisa mengirimkan patchnya juga. Sekali lagi, kirim ke sistem tiket redmine di http://hub.qgis.org/wiki/quantum-gis/issues. Periksa kotak centang `Patch supplied` dan melampirkan patch Anda sebelum mengirimkan bug. Seseorang pengembang akan meninjau dan menerapkannya ke QGIS. Harap jangan khawatir jika patch Anda tidak diterapkan langsung — pengembang terikat dengan komitmen-komitmen lainnya.

20.4 Blog

Komunitas juga menjalankan weblog di http://planet.qgis.org/planet/ yang memiliki beberapa artikel menarik bagi pengguna dan pengembang juga disediakan oleh masyarakat dalam blog lain. Anda diundang berkontribusi pada blog QGIS Anda sendiri!

20.5 Plugin

Situs web http://plugins.qgis.org menyediakan web resmi Portal plugin QGIS. Di sini Anda menemukan daftar semua plugin QGIS stabil dan eksperimental tersedia melalui 'Repositori Plugin QGIS Resmi'.

20.6 Wiki

Akhirnya, kami memelihara situs web WIKI di http://hub.qgis.org/projects/quantum-gis/wiki di mana Anda dapat menemukan berbagai informasi berguna yang berhubungan dengan pengembangan QGIS, rencana rilis, tautan untuk mengunduh, pesan petunjuk-terjemahan dan sebagainya. Silakan dikunjungi, ada banyak informasi bagus didalamnya!

BAB 21

Appendix

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Version 2, June 1991

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